FINAL REPORT ON U.S. ARMY METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION PROGRAM

INTERIM REPORT
BFLRF No. 233

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A methanol-fueled fleet test demonstration program was conducted using administrative-type vehicles to determine the feasibility of using methanol as an alternative fuel. Over 1,026,000 miles were accumulated using 64 administrative-type vehicles. Approximately 750,000 of these miles were accumulated using M85 methanol fuel. Existing engines engineered for use with gasoline and special methanol engines engineered for use with M85 methanol fuel were included in the demonstration program.

Fuel economy, in miles per gallon, obtained for vehicles using M85 fuel is shown to be approximately one-half that obtained using regular unleaded gasoline. When the costs of M85 fuel and unleaded gasoline are included in economic calculations, it is shown that using M85 increases the fuel cost by a factor of approximately 3.0.

No catastrophic engine failure occurred using either fuel. Even though wear rates, indicated from used oil sample analyses, obtained when using M85 fuel appear to be 2 to 4 times those obtained using unleaded gasoline, actual

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16. SUPPLEMENTARY NOTATION

Color photographs showing wear in the engines of the vehicles are on file at Belvoir RDE Center, STRBE-VF. To conserve project funds, a limited number of reports that include Appendices C and E have been printed. Offices receiving all appendices are noted in the attached distribution list. Complete copies may be obtained from the Defense Technical Information Center.

19. ABSTRACT

wear, from inspections and measurements, does not appear to be as severe. No significant increase in individual vehicle maintenance, other than increased oil drains, was noted for the methanol vehicles.

M85 refueling stations were set up at four fleet test sites, and no significant operational problem, safety or otherwise, was encountered during the program. Keywords: Engine oils; Refueling stations; Engine deposits; Passenger vehicles; Pickup trucks. (AED)

EXECUTIVE SUMMARY

Problems and Objectives: The U.S. Army Methanol-Fueled Administrative Vehicle Demonstration Program was conducted as the result of a 1984 request by then Vice President Bush to Secretary of Defense Wineberger and legislative directives contained in FY85 Department of Energy Authorization bill, Section 202, PL 98-525. The objective of the demonstration program was to establish the feasibility of using methanol as an alternative fuel for administrative-type vehicles in the instance of a future gasoline shortage due to a natural shortage of petroleum or a shortage due to political idiosyncrasies of the oil-producing nations. Under the provisions of the legislation, the Department of Army was requested to purchase new methanol-compatible vehicles, establish the durability of these vehicles in laboratory and fleet tests, test a percentage in cold weather environments, and resolve related support functions relative to methanol fuel utilization.

Importance of Project: It was determined early in the program that no U.S. automobile manufacturer would consider manufacturing the small number of methanol-compatible vehicles required for the demonstration program. Therefore, an alternate approach became necessary, which was the conversion of gasoline-powered vehicles to methanol-compatible vehicles. The conversion technology initially selected was that used by the Bank of America (BofA) for its methanol-powered vehicle fleet in response to the gasoline shortages of the 1970's.

Technical Approach: The demonstration program was initially structured to consist of three phases, each building upon the previous phase in terms of experience gained. Phase I was a small conversion fleet involving five converted 1984 General Motors Chevrolet Citations operating for 4,000 miles to demonstrate the applicability of the BofA conversion technology and to provide a means for training U.S. Army personnel in the areas of engine conversion and maintenance. Phase II originally involved twenty-five 1985 General Motors Chevrolet S-10 pickup trucks, twenty-two being converted to use methanol fuel while three were operated on unleaded gasoline as baseline vehicles. Later in Phase II, twenty-five 1983 Ford Escort sedans, manufactured for the State of California by Ford Motor Company to use methanol fuel, were purchased from the California Energy Commission and phased into the program. In addition, Chrysler Corporation made four new carbureted engines, engineered to use methanol fuel, available to the program. These engines were obtained, installed in 1985 Chrysler K-cars, and included in Phase II of the demonstration program. Three similar Air Force-owned Chrysler K-cars operating on unleaded gasoline in the same fleet use were also included in the Phase II program as baseline vehicles.

Two Army-owned Chevrolet Citations, operating on unleaded gasoline, were included as baseline vehicles at the Presidio of San Francisco. These two vehicles resulted in a total of 64 vehicles operating at four different geographical sites being included in the overall program.

Accomplishments: A total of 1,026,228 miles was accumulated during the program. Seventy-three percent or approximately 750,000 miles were obtained using M85 methanol fuel. Increased wear, as indicated from used oil analyses, was noted for the vehicles using M85 fuel, compared with the vehicles using unleaded gasoline. However, it should be noted that no catastrophic failure occurred using either fuel. Inspection and measurement of selected M85 and gasoline engines at the end of the program did not indicate any real significant wear areas for either fuel when compared with published production specifications.

Also, four Chevrolet vehicles, two each with L-4 engines and two with V-6 engines, were evaluated for cold start performance. One engine from each engine type evaluated was operated using unleaded gasoline and the second engine from each type was operated using M85 fuel. Both gasoline control vehicles were started successfully at temperatures of 0°F (-18°C) using the BofA specified SAE 40 engine oil. Using M85 fuel and SAE 40 engine oil, the minimum unaided starting temperature was approximately 20°F (-7°C) for the V-6 engine and 45°F (7°C) for the L-4 engine. The V-6 engine started much easier and at lower temperatures than the L-4 engine, which was attributed to a heated grid located under the carburetor as standard equipment. The use of M82 fuel, which can be easily blended in the field, lowers the starting temperatures by about 10 degrees for both engines. The L-4 engine was successfully started at temperatures lower than 0°F (-18°C) with the use of an optional electric heater installed in the heater hose in the coolant system of the engine.

Six different formulated engine oils were evaluated to determine which engine oil would provide the best wear and/or corrosion protection for the administrative-type vehicle engines operating on M85 methanol fuel. The six lubricants were first evaluated using a modified ASTM Sequence V-D cyclic test procedure. The three best oils were then evaluated in a second test series using steady-state/cold test conditions. These three oils provided the same order of protection in both test series. As a result, all three lubricants, which were formulated specifically for use in engines operating on M85 fuel, are recommended for use in administrative-type vehicle engines to be operated using M85 methanol fuel.

Additionally, four similar, but different, types of M85 refueling facilities were fabricated and were operated satisfactorily. A 500-gallon steel storage tank, pump, meter, hose, and dispensing nozzle were mounted on a flat-bed truck for dispensing M85 fuel at the Presidio. A 1,000-gallon, above-ground, double-walled steel storage tank, with a modified commercial-type pump and a "California Vapor Return" system for receiving and dispensing fuel, was installed at Fort Ord. Fort Ord also used two of the three specially-modified Army standard 600-gallon aluminum tank-pump units (TPU) as a storage and dispensing unit for M85 fuel. The third modified TPU unit was mounted on a truck and used as the dispensing unit for U.S. Air Force vehicles at Fort Sam Houston. A 6,000-gallon, above-ground, double-walled steel storage tank with a modified commercial-type dispensing pump and a "California Vapor Return" system was installed at Sierra Army Depot for its M85 fuel.

Military Impact: In event of a gasoline shortage in the future, an alternative fuel will be required by the military's fleet of spark-ignition engine, which primarily power administrative vehicles. One of the most likely candidates to extend the gasoline supply is a methanol/gasoline blend. M85 fuel (85 percent methanol and 15 percent unleaded gasoline) cannot be consumed directly and may result in increased wear, corrosion, and other maintenance problems if the engines are not modified with care and the materials of construction of the parts exposed to the fuel are not selected properly. However, this demonstration program has shown that existing engines, engineered for use with gasoline, can be successfully modified and operated with no significant deleterious effect when reasonable effort has been taken in the selection of materials and modifications. The engines that were engineered by their respective manufacturers to operate on M85 appeared to show as much wear on parts such as rings, cylinders, and valve guides as the converted gasoline engines using the M85 fuel.

FOREWORD/ACKNOWLEDGMENTS

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I. BACKGROUND

During the last few years, increasing interest has been shown in the use of methanol as a possible alternative transportation fuel to gasoline and diesel fuel and as a fuel to improve the environmental quality. Much research and development have been conducted by the Department of Energy (DOE), U.S. Army Belvoir Research, Development and Engineering Center (Belvoir RDE Center), the State of California, the Bank of America (BofA), and others. This research has culminated in a number of modified methanol-fueled vehicle tests fleets being operated for the purpose of demonstrating the acceptability of methanol fuels. A number of vehicle, accessory, and methanol manufacturers has also been involved in this research effort, resulting in the development of methanol-tolerant vehicles and fuel-handling systems. However, several potential problems with the use of methanol fuels have either not been resolved or have not been adequately evaluated in actual field service.

There is an increasing interest at the national level in methanol as a fuel. As a result, efforts are underway to identify and remove any legal or administrative impediments to methanol use. Also, there has been a desire to both identify any problems with incorporating methanol vehicles within the Government's administrative fleet and to stimulate further the production and use of methanol-fueled vehicles.

This program was initiated by the U.S. Army with Belvoir Fuels and Lubricants Research Facility (SwRI) (BFLRF) to initially assist the Jet Propulsion Laboratory (JPL) in planning and conducting the Army Methanol-Fueled Administrative Vehicle Demonstration Program and to provide backup for identifying and resolving any operational problems within the fleet.

The demonstration program was initially structured to consist of three phases, each building upon the previous in terms of experience gained. Phase I was a small conversion fleet involving only five converted 1984 General Motors Chevrolet Citation sedans operating for 4,000 miles to demonstrate the applicability of the BofA conversion technology and to provide a means for training US Army personnel. Phase II, as originally planned, was to be a medium-fleet conversion involving twenty-five converted 1985 General Motors Chevrolet S-10 pickup trucks. These vehicles were to operate for 12,000 to 15,000 miles as a means to establish the durability aspects of methanol-fueled operation. Phase III was to then follow with a large fleet conversion involving up to 1,000 vehicles at several DOD installations.

Phase II was expanded about midway in the program to include 25 Ford Escort sedans with special built 1.6-liter M85 engines, and four Plymouth K-cars with special built 2.2-liter M85 engines. As a result, 64 vehicles, including baseline gasoline vehicles, were included in the Phase II demonstration program.

JPL subsequently removed itself from the demonstration program early in Phase II, at the completion of modifications made on the S-10 pickup trucks assigned to Fort Ord. At that time, BFLRF assumed the management responsibilities of all subsequent operations of the demonstration program.

JPL Report JPL D-4415(1)* summarizes the portion of the program conducted by JPL and includes the detailed conversion descriptions for converting the 2.5-liter L-4 and the 2.8-liter V-6 General Motors Chevrolet engines to use M85 fuel.

A program plan entitled "U.S. Army's Methanol-Fueled Administrative Vehicle Demonstration Program Plan" was developed to define responsibilities, details of planned activities, projected accomplishments, and milestone schedules. Following extensive coordination, the plan was finalized and promulgated within the Department of Defense (DOD) on November 1986.(2)

II. INTRODUCTION

In compliance with Section 202 of Public Law 98-525, the Department of Defense conducted a demonstration program involving the operation of administrative vehicles on methanol fuel. Under the provisions of this legislation, the Department of Army was requested to purchase new methanol-compatible automobiles, establish the durability of these cars in laboratory and fleet tests, test a percentage in cold weather environments, and resolve related support functions relative to methanol fuel utilization.

The U.S. Army structured and implemented a demonstration program to develop the necessary data for compliance with those provisions given in Section 202 of Public Law 98-525. It was determined early in the program that no automobile manufacturer in the United States would

*Underscored numbers in parentheses refer to the list of references at the end of this report.

consider manufacturing the small number of methanol-compatible vehicles required for this demonstration program. Therefore, it became necessary to consider an alternate approach, which was the conversion of gasoline-powered vehicles to methanol-compatible vehicles. The conversion technology selected for use in this program was identical to that used by the Bank of America (BofA) in its methanol-powered fleet, which was initiated and developed for its own use in response to the gasoline shortages of the 1970s.

As mentioned earlier, the demonstration program was originally planned to consist of three phases, each building upon the previous phase in terms of experience gained. As it turned out, Phase II was enlarged from 25 vehicles to 64, and it was decided not to recommend continuing with Phase III due to the success and lack of problems encountered during the expanded Phase II of the program.

Three reports (3-5) published and distributed earlier represent specific additional work included in the program, but not included in detail in this report.

III. PROGRAM OBJECTIVES

The objectives of the U.S. Army Methanol-Fueled Administrative Vehicle Demonstration Program were to:

- Determine the feasibility of using methanol as an alternative fuel for administrative-type vehicles.
- Establish the durability of these vehicles in laboratory and fleet tests.
- Test a percentage of the vehicles in cold weather environments.
- Resolve any related support function relative to methanol fuel utilization including handling and storage of the fuel.

IV. FLEET DEMONSTRATION PROGRAM

Phase I of the fleet demonstration program was conducted by JPL, coordinating the work of BofA in converting four used Chevrolet Citation sedans, purchased from BofA, to operate using M85 methanol fuel. Two of the vehicles were powered by 2.5-liter L-4, fuel-injected

Chevrolet engines and two were powered by 2.8-liter V-6 carbureted Chevrolet engines. A fifth pre-owned V-6 Citation was purchased by JPL and subjected to engineering evaluation testing at JPL using gasoline, after which it was converted to use methanol by BofA personnel. Following the conversion, the vehicle was returned to JPL for further engineering evaluations using M85 methanol fuel.

The four converted Citation sedans were assigned to Presidio of San Francisco and placed into regular three-shift operation by the military police security force at Presidio. Over 36,000 miles of operation using M85 fuel were accumulated on the four Citation sedans during the first 3 months of operation.

Based upon the satisfactory conversion and operation of the four Citation vehicles at the Presidio of San Francisco, Phase II was initiated by JPL. The initial Phase II consisted of the Army purchasing 25 new S-10 pickup trucks. These pickups were assigned to Fort Ord and were used in normal transportation motor pool service. All 25 pickups were "broken-in" for approximately 5,000 miles using regular unleaded gasoline. After this break-in period, 5 of the 7 pickups powered by 2.5-liter L-4 engines and 16 of the 18 powered by 2.8-liter V-6 engines were converted to use M85 fuel using the same BofA technology as that used with the Presidio vehicles. The only difference in the conversion procedure was that the conversions were made at Fort Ord by Army motor pool maintenance personnel. One L-4 powered pickup was taken to the JPL laboratory after the break-in period and subjected to engineering evaluations using gasoline. The pickup was then converted to use M85 fuel, and further engineering evaluations using M85 fuel were conducted.

The V-6 Citation and L-4 pickup were both assigned to the Ford Ord fleet operation at the completion of the engineering tests performed and reported (1) by JPL.

About midway in Phase II of the fleet demonstration program, an opportunity to include two different manufacturers vehicles with engines engineered to use methanol fuel was made possible. As a result, 25 Ford Escort sedans, manufactured special in 1983 for the State of California by Ford Motor Company to use methanol fuel, were purchased from the California Energy Commission and phased into the fleet demonstration program. These vehicles had been used by California state employees in the Los Angeles area. The odometer readings

from the 25 Ford Escorts ranged from as little as 1,779 miles to 15,342, with the average being approximately 11,300 miles. Five of these vehicles were delivered to Fort Ord and included in its transportation motor pool fleet, and the remaining 20 were shipped to the Sierra Army Depot. Sierra Army Depot was selected for one of the fleet test sites, since it was located at an altitude of approximately 6,500 feet and normally had much colder weather, down to 0°F in the winter, than the other test sites.

About the same time, Chrysler Engineering made four special M85 engines available to the Army at a very reduced price. These four engines were purchased along with modified fuel tanks, fuel lines, and other parts necessary to convert a standard 1985 gasoline K-car to use M85 fuel. Four 1985 Plymouth K-cars were purchased by BFLRF from a local rental car company, and the gasoline engines were removed and replaced with the new 2.2-liter engine engineered to use M85 methanol fuel. Each K-car had approximately 30,000 miles on the odometer when purchased. BFLRF personnel made the engine changes and the fuel tank and fuel line changes, with technical assistance provided by an engineer and senior mechanic from Chrysler Engineering. The four Plymouth K-cars were assigned to an Air Force Group at Randolph Air Force Base, TX, after being converted to M85 methanol fuel. The K-cars were then operated by San Antonio Real Property Maintenance Agency (SARPMA) personnel in their normal transportation motor pool requirements in the San Antonio area. The inclusion of these U.S. Air Force vehicles essentially converted the "Army" program to a DOD Methanol-Fueled Administrative Vehicle Demonstration.

Two 1984 Citation sedans assigned to the military police security force at the Presidio and operated in the same type service assignments, using gasoline, were included in the data collection portion of the program as baseline gasoline vehicles. In addition, SARPMA had three K-cars with 2.2-liter engines being used in similar operational assignments as the four M85 vehicles. The three 1986 K-cars operated by SARPMA were also included in the data collection portion of the program as baseline gasoline vehicles. The only difference in the 1985 M85 K-cars and the 1986 K-cars was that the 1985 K-cars were carbureted engines and the 1986 K-cars were fuel-injected engines.

TABLE 1 summarizes the fleet test sites and the vehicles operated at each site.

TABLE 1. Fleet Test Sites and Vehicles Operated at Each Site

Fleet Site	No. of Vehicles		Manufacturer	Engine	
	Gasoline	M85		Conf[illegible]	[illegible]
Presidio of San Francisco, CA	2	2*	Chevrolet	L-4	2.5
		2**	Chevrolet	V-6	2.8
Ford Ord, CA	1	7*	Chevrolet	L-4	2.5
	2	16**	Chevrolet	V-6	2.8
		5*	Ford	I-4	1.6
Sierra Army Depot, CA		20**	Ford	I-4	1.6
Randolph Air Force Base, TX (SARPMA)	3*	4**	Chrysler	I-4	2.2

*Throttle body injected
**Carbureted

Photographs of the four different vehicle models are presented in Figs. 1 through 4. The police light bars and radios had been removed form the Presidio Chevrolet Citations when their photograph (Fig. 1) was taken.

Figure 1. 1984 Chevrolet Citation sedans operated at the Presidio of San Francisco

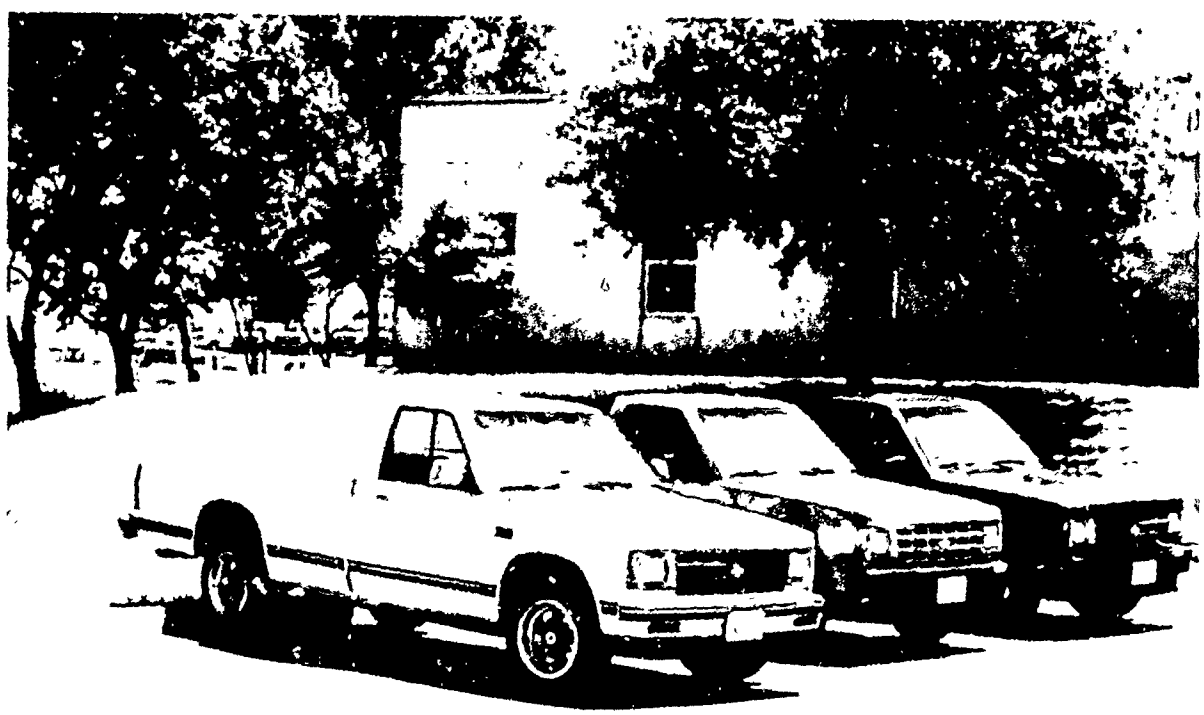

Figure 2. 1985 Chevrolet S-10 pickups operated at Fort Ord

Figure 3. 1983 Ford Escort sedans operated at the Sierra Army Depot

Figure 4. 1985 Plymouth K-Cars operated by SARPMA in the San Antonio Area

V. EQUIPMENT AND TEST PROCEDURES

A. Vehicle/Engine Modifications

Detailed descriptions of the specific changes and modifications made to the various engines and vehicles are reported in detail in other published reports (1,6) for the Chevrolet and Ford engines. TABLES 2 and 3 summarize the modifications made for these engines. Chrysler has not published detailed modifications for its 2.2-liter I-4 engine. However, TABLE 4 denotes those modifications made on the Chrysler engine. As noted in TABLES 2 through 4, in general the same modifications were required for all vehicles modified to operate on M85 fuel.

TABLE 2. Bank of America (BofA) Conversion Technology for Chevrolet L-4 and V-6 Engines

- CARBURETOR MODIFICATIONS
  - Enlarged Calibrated Fuel Passages for Increased Flow
  - Electroless Nickel Plating on Carburetor Interior Surfaces
  - Replacement of Elastomer Components (pump cup, float needle, mixture O-ring)
- IGNITION MODIFICATIONS
  - Replacement of Spark Plugs (i.e., lower heat range)
  - Resetting Ignition Timing
- FUEL TANK MODIFICATIONS
  - Substituting 14-Gallon Standard Tank With 21-Gallon Low Carbon Steel Tank
  - Replacement of In-Line Fuel Filter
  - Replacement of Fuel Level Sending Unit

TABLE 3. Modifications on Ford 1.6-Liter Carbureted Methanol-Fueled Escorts

- Chrome Top Compression Rings
- Compression-Ratio Increased From 8.8:1 to 11.8:1
- Carburetor Recalibrated for Increased Volume Requirements
- Ignition Timing Modified
- Spark Plugs Changed - Two Heat Ranges Colder
- Stainless Steel Fuel Tank and Fuel Lines and Electroless Nickel-Plate on Carburetor
- Engine-Mounted Fuel Pump Nickel-Plated and Elastomers Changed
- Supplementary Electric Fuel Pump and Fuel Filter Mounted Near Fuel Tank

TABLE 4. Modifications on Chrysler's 2.2-Liter Carbureted Methanol-Fueled K-Cars

- Compression Ratio Increased to 11.5:1
- Chrome Top Compression Rings
- Nickel-Plated Mechanical Fuel Pump With Internal Material Changes
- Nickel-Plated Carburetor With Internal Material Changes and Increased Fuel Flow Capability
- Spark Plugs - Champion N6Y
- Fuel Tank, Fuel Tank Filler Tube, Fuel Lines, and Fuel Filter - Stainless Steel
- Fuel Level Sending Unit - Nickel Plated
- Fluorelastomer Fuel Hoses
- Revised (New) Electronic Computer Control Board

The general specifications for the engines used in the demonstration program are presented in the following tabulations:

Component	Chevrolet		Ford	Chrysler
Engine size, liter	2.5	2.8	1.6	2.2
Configuration	L-4	V-6	I-4	I-4
Compression ratio	9.0	8.5	11.8	11.5
Manufactured to use Methanol	No	No	Yes	Yes

B. Fuels

1. Methanol Fuel

The methanol fuel used in Phase I of the demonstration program was M85 blended to the BofA specification (85 percent methanol, 15 percent premium unleaded gasoline, plus 2 lb FA5 per 1000 gallons of fuel). FA5 is a proprietary fuel additive for use with methanol and is available from BofA. The M85 fuel used in Phase I was obtained from a BofA refueling facility in downtown San Francisco. Methanol fuel was purchased from Redwood Oil Company to BofA specifications during Phase II of the program for use at the Presidio and Fort Ord. The M85 methanol used at the Sierra Army Depot was also purchased from Redwood Oil Company; however, it was specified to be blended to the State of California specifications, which does not include the proprietary BofA additive. The M85 methanol fuel used in the Chrysler vehicles was blended by BFLRF to the Chrysler Corporation specification (85 percent methanol, 13 percent premium unleaded gasoline, and 2 percent toluene to improve luminescence in case of a fire).

Appendix A presents a copy of the State of California specification for M85 methanol fuel. This specification is the same as that specified by Ford Motor Company, and practically the same as the BofA specification except for the addition of the proprietary BofA additive.

2. Gasoline

Regular unleaded gasoline from the normal supply channels was used in all baseline vehicles at all the fleet sites. In addition, regular unleaded gasoline was used to break in the new Chevrolet S-10 pickups at Fort Ord. It is assumed that the five Citation vehicles, purchased from BofA for Phase I of the program, were all operated on regular unleaded gasoline prior to being purchased for the demonstration program.

C. Engine Oils

1. Engine Oils for Methanol Vehicles

Three different engine oils formulated specifically for use in engines using M85 methanol fuel were used during the demonstration program. Since the BofA technology was used to convert the Chevrolet L-4 and V-6 engines to use M85 fuel, an SAE 40 oil recommended by BofA and purchased from BofA was used in all the Chevrolet engines operated on M85 fuel at the Presidio and Ford Ord. An SAE 20W-40, Ford Motorcraft oil was used in all Ford Escort vehicles due to the requirements of the Ford Motor Company warranty, which was obtained with the purchase of the Escorts. The third oil, an SAE 10W-30 oil (OS-59567), was recommended by Chrysler Engineering and supplied by Lubrizol Corporation for use in the Plymouth K-cars. Analyses of new samples of the three oils are presented in TABLE 5.

2. Engine Oils for Gasoline Vehicles

The two baseline vehicles operated on unleaded gasoline at the Presidio and the three gasoline baseline vehicles operated at Fort Ord and SARPMA used MIL-L-46152 specification oils from the regular supply channels. It should be mentioned that all the Chevrolet vehicles operated at Fort Ord used the MIL-L-46152 specification oil during their nominal 5,000-mile break-in period, after the initial factory fill was drained.

TABLE 5. Analyses of New Lubricant Samples for Use in Engines Using M85 Fuel

Oil	Test Method	Bank of America	Chrysler Lubrizol	Ford Motorcraft
SAE Viscosity Grade		40	10W-30	20W-40
Viscosity, cSt, at				
40°F	D 445	135.6	72.0	118.2
100°C	D 445	14.0	11.1	14.1
Viscosity Index	D 2270	100	145	119
Total Acid No. (TAN)	D 664	2.68	3.42	3.49
Total Base No. (TBN)	D 664	10.5	7.4	6.6
Elements, ppm, by ICP				
Iron (Fe)		1	2	3
Chromium (Cr)		<1	<1	9
Lead (Pb)		3	<1	3
Copper (Cu)		3	<1	0
Tin (Sn)		<1	<1	0
Aluminum (Al)		<1	<1	3
Nickel (Ni)		<1	<1	0
Silver (Ag)		<1	<1	0
Manganese (Mn)		<1	<1	0
Silicon (Si)		16	4	4
Boron (B)		199	97	5
Magnesium (Mg)		2091	9	760
Calcium (Ca)		9	*	1550
Barium (Ba)		1	94	0
Phosphorus (P)		1329	1225	1570
Zinc (Zn)		1401	1337	1780

*Not measured.

3. Lubricant Sampling Procedure

It was requested that the engine oil in each vehicle be changed after each 3,000 miles of operation. In addition, in order to obtain data for each vehicle with respect to lubricant degradation, fuel dilution, lubricant additive package depletion, and wear metal content, a lubricant sampling procedure was initiated. A copy of the lubricant sampling procedure is presented in Appendix B. Lubricant samples were requested to be drawn each 1500 miles of operation or each 30 days, whichever occurred first. In addition, samples were to be drawn

just prior to each oil change, and just after the new oil had been added to the engine and the engine operated for approximately 10 minutes.

VI. RESULTS OF FLEET TEST DEMONSTRATION

A. Fleet Test Results

1. General

A total of 1,026,228 miles were accumulated during the fleet test demonstration program. Approximately 750,00 miles, or 73 percent of the total miles, were accumulated using M85 methanol fuel.

2. Fuel Economy

A summary of the fuel economy data for each engine type, summarized by fleet test sites, is presented in TABLE 6. Individual monthly mileage and fuel usage summaries for each of the sixty-four vehicles are included as Appendix C. These data are assembled by vehicle number and test site. TABLE 6 shows the fuel economy for vehicles operating on M85 methanol fuel to range from 9.2 miles per gallon for the Chevrolet V-6 engines at Fort Ord to 15.5 miles per gallon for the Plymouth K-cars operated by SARPMA. Where similar gasoline vehicles were operated in the same fleets as the M85 vehicles, it will be noted that the M85 fuel provides approximately 50 percent of the mileage reported for the gasoline vehicles. The Chevrolet L-4 engines operated at the Presidio using M85 fuel gave about 67 percent of the mileage reported for the L-4 gasoline vehicles at the Presidio.

TABLE 6. Summary Fuel Economy Data for Each Engine Type

Engine Manufacturer	Engine	Fuel	Number of Vehicles	Total Cumulative Miles	Cumulative mpg(a)	Gasoline Equivalent(b)
PRESIDIO OF SAN FRANCISCO						
General Motors	L-4	Gasoline	2	57,892	17.1	
General Motors	L-4	M85	2	69,386	11.5	20.2
General Motors	V-6	M85	2	73,942	9.8	17.2
FORT ORD						
General Motors	L-4	Gasoline	7(c)	58,146	19.9	
General Motors	L-4	M85	6	63,025	10.1	17.8
General Motors	V-6	Gasoline	18(c)	125,774	19.3	
General Motors	V-6	M85	17	268,450	9.2	16.2
Ford Motor Co.	I-4	M85	5	49,417	11.2	19.7
SIERRA ARMY DEPOT						
Ford Motor Co.	I-4	M85	20	170,578	12.6	22.2
RANDOLPH AIR FORCE BASE(d)						
Chrysler Corp.	I-4	Gasoline	3(e)	35,112	31.0	
Chrysler Corp.	I-4	M85	4	54,506	15.5	27.3

(a) Total miles divided by total fuel used.

(b) Gasoline Equivalent = $\frac{\text{Net Btu/gal. for gasoline}}{\text{Net Btu/gal. for M85}}$ × actual mpg, or 1.76 × mpg.

(c) Includes break-in mileage of all S-10 vehicles prior to conversion to M85 fuel.

(d) Vehicles operated by SARPMA personnel.

(e) Gasoline vehicles were throttle body injection engines; M85 vehicles were carbureted engines.

TABLE 7 shows the comparative differences in economy values between similar engines using the same fuel at different operating fleets sites.

TABLE 7. Comparative Differences in Economy Values of Similar Vehicles

Engine	Fleet Site	Fuel	Cumulative mpg (a)	Comparative Economy, % (b)
General Motors L-4	Presidio	Gas	17.1	
	Fort Ord	Gas	19.9	85.9
	Presidio	M85	11.5	
	Fort Ord	M85	10.1	87.8
General Motors V-6	Presidio	M85	9.8	
	Fort Ord	M85	9.2	93.9
Ford I-4	Fort Ord	M85	11.2	
	Sierra	M85	12.6	88.9

(a) From TABLE 6
(b) The smaller mpg divided by the larger mpg

These comparative economy values in TABLE 7 appear to be very reasonable considering they represent mileages accumulated in actual operating dispatch service using drivers with varying degrees of driving proficiencies. It should be mentioned that an error in the dispensing fuel meters cannot be blamed for any of the variations, since calibration of all fuel meters, methanol dispensing and gasoline dispensing, were checked early in the program. Only the dispensing unit used later at SARPMA required adjustment, and this unit was corrected before it was installed at the SARPMA refueling area. The 50-percent values obtained for the fuel economy comparisons between M85 and gasoline compare favorably with results reported from a DOE fleet test program (7), and an M90 fleet test program conducted by the city of Baltimore (8), and the California methanol fleet test program.(9)

3. Equipment Problems Related to M85 Fuel

Even though care was taken in the selection of materials used in the methanol fuel systems, it was anticipated at the start of the program that numerous equipment problems would be encountered. No catastrophic failures were encountered during the entire demonstration program. Failures were encountered that were related to the use of M85 fuel, but these failures were limited to components such as fuel pump, flexible fuel lines, and carburetor floats. TABLE 8 summarizes the vehicle and component failures reported during the demonstration program that were believed to be related to the use of M85 fuel.

TABLE 8. Fuel-Related Vehicle and Component Failures

Vehicle/Engine	Fleet Site	Component Failed
GM/L-4 and V-6	Presidio and Fort Ord	All fuel level sending units provided during initial conversion by BofA.
GM/L-4	Presidio and Fort Ord	All flexible fuel lines furnished with L-4 conversion by BofA.
GM/L-4	Presidio	Two fuel pumps after 4,900 and 17,700 miles operation on M85. First BofA conversions.
Chrysler/I-4	SARPMA	Two fuel level sending units. Initial Chrysler conversion.
Ford/I-4	Sierra Army Depot	Two carburetor floats returned to Ford under warranty.
Chrysler/I-4	SARPMA	All carburetor floats replaced with floats having smaller pivot bearing width.
Chrysler/I-4	SARPMA	One carburetor float replaced due to leak in plastic float.

One stock fuel pump failed and was replaced on a Chevrolet Citation V-6 after 64,010 miles (approximately 45,700 miles using M85) at the Presidio of San Francisco. Upon inspection of this pump, it was determined that it was a mechanical failure of a metal rod that operated the diaphragm, and, therefore not considered to be methanol fuel related.

The Chrysler vehicles operated by SARPMA did not have a specific failure in this case, but hot-start problems were encountered when the ambient temperature was above approximately 80°F (27°C). This problem was corrected by replacing the engine-mounted fuel pumps with low-pressure in-tank electric fuel pump assemblies (which also corrected the fuel level sending unit problem encountered earlier), and adding a 10-minute run-on electric radiator fan at the suggestion of the Chrysler project engineer. All the necessary parts needed to correct the problems encountered with the Chrysler vehicles were provided by Chrysler Engineering in an expedient manner and at no cost to the demonstration program.

B. Fuel Quality

Fuel samples were taken at each of the operating sites in accordance with the detailed fuels sampling procedure presented in Appendix D. When M85 fuel was first delivered to Fort Ord early in phase II, the fuel received, which was drawn from the delivery tanker prior to unloading into the Fort Ord storage tank, did not have the appearance of a good M85 fuel sample. A two-phase sample (a light amber fluid in the top 50 percent of the sample and dark brown fluid on the bottom 50 percent) was obtained after setting for a 12-hour period on a laboratory bench. Subsequent analysis and discussions with the M85 supplier indicated that the light amber fluid was primarily methanol, and the dark brown fluid was primarily the oil carrier that the FA5 additive was mixed with prior to blending. It was at this time that the fuel supplier stated that the M85 fuel, whether blended to BofA specification or the State of California specification, was splash blended in the delivery tanker and is assumed to be mixed by the time it is delivered to customer's tank. Based upon this information, no further M85 samples from the tanker delivering the fuel were required. It was requested that when receiving M85 fuel that the fuel be recirculated within the tanker prior to unloading into the storage tank. In this manner, the sample drawn from the refueling pump 8 to 24 hours after the delivery of fuel would provide a more representative sample of the fuel being provided to that respective fleet.

Selected fuel samples from all four fleet test sites were analyzed throughout the program to determine the quality consistency of the M85 fuel used in this demonstration program. TABLE 9 presents a summary of the data obtained from these analyses. A relatively consistent methanol fuel was provided each operating site by the supplier as shown in the following tabulation:

	Methanol, vol%		
Fleet Site	High	Low	Average
Presidio of San Francisco	90.4	84.4	87.2
Fort Ord	91.1	82.6	85.9
Sierra Army Depot*	86.4	85.8	86.1
SARPMA	87.8	84.6	86.8

* The 71.5 percent methanol shown for sample AL-15483 was the first delivery to a new tank that had been flushed with unleaded gasoline prior to the delivery of methanol fuel. All the gasoline had not been removed from the tank. It was estimated by Sierra personnel that approximately 200 gallons of unleaded gasoline remained in the tank after flushing.

All other values are consistent and within the specification requirement for the State of California. Even the water content, which can be a problem with methanol fuels if the fuel-handling systems are not maintained with care, shows a maximum value of 2500 ppm, well within the California specification limit of 0.5 percent.

C. Used Oil Samples

As mentioned earlier, used engine oil samples were drawn from the engine and submitted to BFLRF for analysis. The samples were not taken in the exact sequence as requested in the lubricant sampling procedure (Appendix B), but generally in a manner that the data obtained from the samples can be used. It should be mentioned that this program was run at all four fleet sites in a manner that provided the least interference to normal mission requirements. Although the added test vehicles did provide additional transportation capabilities for the motor pool operators, it also added additional maintenance requirements to the respective maintenance

TABLE 9. Analyses of Methanol Fuel Samples From U.S. Army Methanol-Fueled Administrative Vehicle Demonstration Program

Sample AL- No.	Date	Methanol, vol%	Gasoline, vol%	Additive, ppm	V/L	RVP (Auto)	Specific Gravity	Saybolt Color	Copper Corrosion	Acidity, mg KOH/g	Gum, mg/100 mL		Cl, %	Lead, g/gal	Sulfur, %	Phosphorus, g/gal	Water, ppm	Part. Contam, mg/L
											Unwashed	Washed						
14385(a)	07/10/85	86.8	13.2	175	148.0	7.66	0.7909	13	1A	0.041	2.8	0.5	0.001	<0.01	0.002	<0.01	360	0.2
14393(a)	07/12/85	88.7	11.3	119	146.5	7.50	0.7901	15	1A	0.048	3.0	0.7	0.002	<0.01	<0.001	<0.01	370	0.3
14396(a)	07/16/85	88.2	11.8	170	145.0	7.56	0.7905	13	1A	0.048	2.8	0.6	<0.001	<0.01	0.002	<0.01	485	0.4
14433(a)	07/25/85	84.4	15.6	96	146.0	7.66	0.7914	12	1A	0.049	4.0	0.8	<0.001	<0.01	<0.001	0.002	441	0.0
14569(a)	08/29/85	85.7	14.3	148	-	5.98	0.7914	13	1A	0.045	1.6	1.0	<0.001	<0.01	0.003	0.0004	247	0.3
14634(a)	09/30/85	87.2	12.8	190	145.0	6.78	0.7909	6	1A	0.051	7.1	2.9	<0.001	<0.01	0.007	<0.0002	575	0.3
14636(a)	09/30/85	88.6	11.4	273	148.0	6.82	0.7905	11	1A	0.050	3.0	2.2	<0.001	<0.01	0.004	0.0002	468	0.1
14658(a)	10/16/85	84.8	15.2	216	146.5	6.47	0.7936	15	1A	0.049	1.3	0.7	<0.001	<0.01	0.0[illegible]	<0.0005	385	0.1
14667(a)	10/21/85	87.6	12.4	502	145.0	6.31	0.7905	13		0.048	2.3	1.0	<0.001	<0.01	0.004	<0.0005	354	0.4
14725(b)	11/22/85	85.9	14.1	160	-	8.88	-	19	1A	0.049	4.0	1.1	<0.001	<0.01	0.003	<0.005	319	0.1
14813(a)	12/20/85	86.4	13.6	240	144.5	6.78	0.7896	12	1A	0.051	3.4	0.2	<0.001	<0.01	0.003	<0.005	237	0.1
14822(a)	01/02/86	87.8	12.2	210	140.5	8.46	0.7796	12	-	0.042	-	-	<0.001	-	0.001	-	-	-
14898(b)	02/24/86	89.7	10.3	405	139.0	7.93	0.7887	13	1A	0.057	3.0	1.4	<0.001	<0.01	0.004	<0.005	466	0.9
14927(b)	03/05/86	91.1	8.9	233	137.5	8.37	0.7932	10	1A	0.052	3.2	1.2	<0.001	<0.01	0.002	<0.005	76	0.6
14971(b)	03/24/86	85.0	15.0	174	145.0	7.35	0.7865	10	1A	0.051	4.2	1.2	<0.001	<0.01	0.003	<0.005	301	0.8
15145(b)	05/20/86	85.2	14.8	225	145.0	7.01	0.7905	12	1A	0.045	1.9	1.2	<0.001	<0.01	0.003	<0.005	501	0.2
15211(a)	07/03/86	86.6	13.4	331	141.0	6.73	0.7927	6	1A	0.048	2.0	1.4	<0.001	<0.01	0.002	<0.005	500	0.2
15481(a)	11/03/86	85.1	14.9	475	140.5	7.86	0.7901	9	1A	0.053	3.4	0.7	<0.001	<0.01	0.003	0.0002	850	0.3
15484(c)	11/06/86	71.5	28.5	ND(e)	129.0	9.37	0.7822	-9	1A	0.043	9.9	3.4	<0.001	<0.01	0.006	0.0004	310	1.3
15484(b)	11/06/86	84.8	15.2	64	142.0	7.31	0.7905	5	1A	0.054	1.7	0.7	<0.001	<0.01	0.003	0.0003	320	0.5
15619(c)	12/11/86	86.4	13.6	ND	144.5	6.56	0.7901	+6	1A	0.037	2.3	1.3	<0.001	<0.01	0.003	0.0001	1520	0.1
15730(a)	01/08/87	90.4	9.6	537	141.5	8.20	0.7887	+2	1A	0.048	4.7	2.3	<0.001	<0.01	0.003	<0.0001	2320	0.1
15775(d)	01/19/87	87.8	10.2	ND	140.5	8.32	0.7828	-5	1A	0.058	95.0	3.4	0.001	<0.01	0.006	0.001	2500	4.8
15840(b)	02/09/87	82.6	17.4	176	142.0	7.96	0.7887	+16	1A	0.041	2.1	1.4	<0.001	0.01	0.003	0.0002	398	0.2
15979(c)	04/07/87	85.8	12.2	ND	147.0	6.69	0.7918	+8	1A	0.028	1.6	0.7	<0.001	0.01	0.005	0.0005	2110	0.3
15994(b)	04/13/87	84.9	15.1	171	144.0	7.47	0.7901	+15	1A	0.046	2.2	1.6	<0.001	0.01	0.002	0.0003	530	0.3
16055(d)	05/11/87	87.8	10.2	ND	146.0	6.66	0.7941	-9	1A	0.034	1.6	0.9	<0.004	0.01	0.006	0.0003	2010	0.5
16057(b)	05/14/87	85.2	14.8	413	142.5	7.54	0.7949	+2	1A	0.043	2.6	1.2	<0.001	0.01	0.003	0.0001	1970	1.6
16248(d)	07/13/87	84.6	13.4	ND	147.0	7.43	0.7954	-5	1A	0.014	1.4	-	0.001	<0.01	0.004	0.0001	834	0.1
16261(b)	07/20/87	85.0	15.0	291	143.0	7.76	0.7874	+8	1A	0.024	2.7	1.4	0.001	<0.01	0.003	0.0001	670	0.6
16465(d)	08/11/87	87.3	10.7	ND	143.5	7.36	0.7923	2	1A	0.018	2.2	1.9	0.001	<0.01	0.003	0.0003	900	0.5
17709(d)	06/01/88	86.7	11.3	ND	139.5	7.29	0.7927	0	1A	0.031	4.5	0.8	0.004	<0.01	0.004	0.0002	1340	0.8

(a) From the Presidio of San Francisco
(b) From Fort Ord
(c) From Sierra Army Depot
(d) From SARPMA, contains 2% toluene
(e) ND denotes none detected

units. Therefore, missed oil samples and some extended operating periods between oil changes must be expected with this type program.

Over 700 used oil samples were received and analyzed. The data obtained were added to the used engine oil data base summary presented in the Appendix E. Data in Appendix E are assembled and presented in the order of USA vehicle number. Although some oil deterioration is evident from the viscosity and the total acid and base numbers, no significant oil deterioration was noted except for approximately six samples received from Sierra Army Depot during the first winter of operation with ambient temperatures down to 0°F (-18°C). These used oil samples showed excessive fuel and water dilution, which was not unexpected since short trips and cold weather combine to produce excessive fuel and water dilution even in gasoline-fueled engines. Sierra Army Depot was advised by telephone to change oil in each of these cars immediately before accumulating additional miles, and no other problems were noted.

Engine wear rates were monitored by analyzing each used oil sample for iron, lead, copper, tin, aluminum, and nickel debris using the Inductively Coupled Plasma (ICP) technique. Wear metal data for each individual sample are also presented in Appendix E. A summary of the average wear rates for the six metals, in ppm per 1000 miles, is presented in TABLE 10. Due to the fact that wear is a random occurrence, and unexplained anomalies can occur, it is believed that the overall average wear rates shown in TABLE 10 represent a fair comparison of the wear obtained from similar engines when using gasoline or M85. It will be noted in TABLE 10 that larger average wear rate values were, for the most part, obtained when using M85 fuel. It should be pointed out that the wear rates obtained using gasoline at Fort Ord are probably somewhat higher than would be expected in normal gasoline service since both sets of data (for the General Motors L-4 and V-6 operating on gasoline) include the break-in period. Further, the approximate five times wear factor shown for the Chrysler I-4 when operating on M85 is no doubt due to the fact that the new methanol engines supplied by Chrysler were broken-in on M85 fuel as part of this operating fleet. The relatively high nickel wear rate shown for the V-6 gasoline engines at Fort Ord (27.1 ppm/1,000 miles) is a result of very high wear during the first oil change period during break-in. For example, baseline vehicle CM2884 showed 340-ppm nickel after the first 2,588 miles, while only 20-ppm nickel was generated during the next 13,007 miles.

TABLE 10. Average Wear Rates for Six Wear Metals From Used Oil Analyses by ICP

Manufacturer	Engine	Fuel	Average Wear Rate, ppm/1000 miles							Wear Factor M85/Gas
			Fe	Pb	Cu	Sn	Al	Ni	Total	
PRESIDIO OF SAN FRANCISCO										
General Motors	L-4	Gas (a)	12.2	7.3	7.0	1.0	1.4	0.2	29.1	
General Motors	L-4	M85	28.5	31.5	19.5	5.8	2.2	2.2	89.7	3.1
General Motors	V-6	M85	32.6	40.4	5.1	4.4	2.2	2.0	86.7	
FORT ORD										
General Motors	L-4	Gas	11.4	35.4	15.8	6.3	1.0	9.0	78.9	
General Motors	L-4	M85	42.0	46.8	11.1	7.4	3.4	5.6	116.3	1.5
General Motors	V-6	Gas	25.6	22.7	11.3	5.8	2.2	27.1	94.7	
General Motors	V-6	M85	51.0	52.1	7.8	7.3	3.3	2.0	123.5	1.3
Ford Motor Co.	I-4	M85	32.7	16.8	1.4	0.8	5.4	0.4	57.5	
SIERRA ARMY DEPOT										
Ford Motor Co.	I-4	M85	47.0	10.0	5.8	0.4	6.1	0.2	69.5	
RANDOLPH AIR FORCE BASE										
Chrysler Corp.	I-4	Gas	4.8	3.4	3.0	1.3	2.1	0.1	14.7	
Chrysler Corp.	I-4	M85	23.7	14.0	8.3	2.9	19.7	0.4	69.0	4.7
								Avg. Wear Factor =		2.6

(a) Unleaded Gasoline

When the total average wear debris, shown in TABLE 10, obtained using M85 fuel is divided by the equivalent engine wear data for unleaded gasoline (boxed-in values in TABLE 10), the overall wear factors for the four sets of data are obtained and are shown in TABLE 10 and summarized below.

	Wear Factor M85/Gas
The Presidio, L-4 engines (89.7 + 29.1)	3.1
Fort Ord, L-4 engines (116 + 78.9)	1.5
Fort Ord, V-6 engines (123.5 + 94.7)	1.3
Air Force, I-4 engines (69.0 + 14.7)	4.7
Average	2.6

Therefore, from the average used oil wear metals data, methanol fuel appears to increase the overall wear rate by 2.6 times that obtained using unleaded gasoline.

D. Inspection and Measurements of Selected Engines

Upon completion of the operational portion of the program, the following vehicles were transported to BFLRF. The engines were removed, inspected, selected parts photographed, and measurements taken of certain wear areas in the engines:

Vehicle No.	Fleet Site	Engine	Operational Fleet
CM3613	Presidio	GM L-4	M85
CM3614	Presidio	GM V-6	M85
CM3616	Presidio	GM V-6	M85
CM2879	Fort Ord	GM L-4	M85
CM2883	Fort Ord	GM L-4	M85
CM2884	Fort Ord	GM V-6	Gasoline
CM2885	Fort Ord	GM V-6	Gasoline
CM2889	Fort Ord	GM V-6	M85
CM2890	Fort Ord	GM L-4	Gasoline
CM2895	Fort Ord	GM V-6	M85
CN0438	Fort Ord	Ford I-4	M85
CN0440	Fort Ord	Ford I-4	M85
CN0545	Sierra	Ford I-4	M85
CN0547	Sierra	Ford I-4	M85

The measurements taken from each of the aforementioned engines are presented in Appendix F. The inspections, conducted using the CRC rating procedure, are shown in Appendix G. The color photographs taken of selected engine parts from each engine are on file at Belvoir RDE Center, STRBE-VF.

Vehicle CM3615, assigned to the Presidio of San Francisco, was wrecked after accumulating a total of 41,300 miles (25,120 miles using M85 fuel) and not returned to service. The L-4 engine was removed by Presidio personnel and shipped to BFLRF, where it was inspected and measured. The data from this engine are also included in Appendices F and G. Measurements data, photographs, crankshaft, rod bearings, and the piston rings from this engine were shown to General Motors Research staff members. They commented that the parts were in good condition considering the number of miles accumulated on the engine. They stated that they had seen much more wear, pitting, or corrosion on parts from other engines with much less M85 service history. It was hypothesized that the 16,185-mile break-in period using unleaded gasoline prior to being converted to use M85 fuel significantly reduced subsequent wear in that engine when using M85 fuel from that normally expected using M85 with no break-in on gasoline. It was decided early in the program that selected engines would be inspected for indications of any gross wear areas at the end of the operational portion of the demonstration program. When the engines were torn down, it was decided to attempt to quantify the wear measurements obtained by comparing them with the respective manufacturers published production specifications (included in each manufacturers shop manual for specific engines and vehicles). It is realized that this method is not the best way to indicate actual wear, since wear could occur during operation of the engine, and the final measured dimension could still be below the manufacturer's specification limit, thereby indicating no wear.

Most of the wear noted from the measurements presented in Appendix F appears to be ring wear, as indicated by compression ring gap increases, and valve guide wear, as indicated by increases in valve stem to guide clearances. TABLE 11 was prepared to compare the indications of wear between gasoline engines and M85 engines, and also between the measurements taken at the end of test and the iron content of the used oil samples. Iron content was used since the major wear areas appear to be primarily on iron or steel items.

TABLE 11. Average Ring Gap and Valve Stem to Guide Clearance Measurements Compared With Iron Content of Used Oil Samples Taken

					Increase Over Specification Limit				
					Average Compression Ring Gap, in.		Average Valve Stem to Guide Clearance, in.		
Engine	Fleet Site	Vehicle	Fuel	Mileage Using Noted Fuel	Top	Bottom	Intake	Exhaust	Iron Content, ppm per/1000 Miles
GM L-4	Presidio	CM3613	M85	45,151	0.0092	0.0018	0.0002	0.0000	35.6
		CM3615	M85	25,120	0.0060	0.0085	0.0000	0.0000	15.7
GM V-6	Presidio	CM3614	M85	45,010	0.0103	0.0053	0.0002	0.0013	21.0
		CM3616	M85	30,613	0.0068	0.0020	0.0005	0.0011	25.6
GM L-4	Fort Ord	CM2879	M85	12,295	0.0000	0.0000	0.0000	0.0000	13.2
		CM2883	M85	14,752	0.0000	0.0000	0.0000	0.0000	42.3
		CM2890	Gas	18,725	0.0000	0.0000	0.0000	0.0000	13.6
GM V-6	Fort Ord	CM2889	M85	10,905	0.0038	0.0028	0.0004	0.0005	116.8
		CM2895	M85	17,796	0.0040	0.0038	0.0003	0.0021	52.8
		CM2884	Gas	15,595	0.0003	0.0022	0.0005	0.0029	30.1
		CM2885	Gas	18,147	0.0002	0.0000	0.0001	0.0007	23.3
Ford I-4	Fort Ord	CN0438	M85	23,680	0.0175	0.0198	0.0010	0.0028	25.2
		CN0440	M85	23,847	0.0128	0.0172	0.0004	0.0008	44.9
Ford I-4	Sierra Army Depot	CN0545	M85	24,873	0.0110	0.0165	0.0016	0.0025	49.3
		CN0547	M85	26,609	0.0140	0.0167	0.0008	0.0010	32.6

Wear measurements obtained from engines using gasoline were compared with those using M85, the GM V-6 engines at Fort Ord. TABLE 11 shows a significant increase in ring and valve guide wear when using M85 fuel. In addition, the iron content, in ppm per 1,000 miles, appears to be a reasonable indicator of relative wear between the M85 and gasoline engine figures, but not between the two M85 GM V-6 engines. The same is not true for the GM L-4 engines at Fort Ord. In fact, looking at iron content, vehicle CM2879 indicates slightly less wear using methanol fuel than CM2890 does using gasoline. Although none of the data in TABLE 11 appears to be out of line, considering the relatively small mileage accumulations on most of the vehicles, it is apparent that even a general correlation between the indicated wear (by measurement) and that shown for iron content from used oil samples does not exist.

The inspected engines were rebuilt with new piston rings, connecting rod bearings, and crankshaft main bearings. The GM L-4 and V-6 engines were converted back to gasoline by replacing the throttle body fuel injectors in the L-4 engines and the carburetors on the V-6 engines. New spark plugs, of the correct heat range, were installed in all the converted engines. The engines were replaced in their respective vehicles and returned to their assigned fleet site.

The Chrysler M85 engines were removed from the vehicles and sent to Chrysler Engineering, where they were torn down and measured. The following tabulation identifies the vehicle from which the engines were removed at the mileage accumulation shown:

Chrysler Engine No.	Vehicle	Miles Accumulated Using Engine
EX165	X79116	14,200
EX166	X79115	13,377
EX167	X79118	14,729
EX168	X79117	14,319

The following comments were received from the Chrysler senior engine development engineer responsible for inspecting the engines. For the most part, the engines appeared to be in good condition following their testing. However, some components did show higher than expected wear for the mileage accumulated. TABLE 12 summarizes the findings.

TABLE 12. Component Wear for Chrysler M85 Engines

Component	Notes
Piston	Negligible wear.
Piston Rings	The rings all showed a high amount of wear. The special chrome top rings had medium to high wear with engine number EX166 being the worse case with a 0.0087 in. (0.220 mm) gap increase when 0.008 in. (0.203 mm) maximum is the Chrysler standard. The second rings were not out of specification, but did show high wear for the mileage. Engine number EX168 was the worse case with a 0.0075 in. (0.191 mm) gap increase. The oil rings showed the highest amount of wear with engines EX166 and EX168 having radial wall thickness decreases of 0.0047 in. (0.120 mm) and 0.0024 in. (0.060 mm). The Chrysler standard is 0.0015 in. (0.038 mm) maximum.
Piston Pin	The piston pin wear was on the high side of the Chrysler standard for wear with engine EX168 being the highest at 0.0005 in. (0.012 mm) wear.
Piston Pin Bore	The wear on the pin bore was high for the vehicle mileage, but none of the engines was out of specification.
Crankshaft Main Journal	No significant wear.
Crankshaft Main Bearings	Medium to low wear. Engine EX166 did exhibit wear equal to Chrysler's standard of 0.0002 in. (0.005 mm).
Connecting Rod Journal	No significant wear.
Connecting Rod Bearing	No significant wear.
Camshaft Journal	High camshaft journal wear. Chrysler's standard for maximum wear is 0.0001 in. (0.003 mm) and both engines EX165, 0.0002 in. (0.005 mm) and EX166, 0.0004 in. (0.009 mm) exceeded that standard.
Camshaft Bearing Area	No significant wear.
Exhaust Valve	All the wear data for the stem were well below the Chrysler standard. The valve face and seat runout data were also acceptable.
Intake Valve	Chrysler's standard for the stem wear is zero wear. All the intake valve stems showed some wear, with the highest on engine EX165 at 0.0003 in. (0.008 mm). The valve face and seat runout data were also acceptable.
Exhaust Valve Guide	Higher than desired valve guide wear was seen on all the engines, but only engine EX165 was out of the Chrysler standard of 0.0040 in. (0.102 mm) maximum. This engine had 0.0056 in. (0.143 mm) wear.
Intake Valve Guide	Average wear for the mileage.

All other components were in acceptable condition. All the valve seals were in excellent condition as were the rotating shaft seals. All the gasket sealing surfaces were in very good condition and all of the fastener torques were in their acceptable ranges.

E. Disposition of Fleet Vehicles and M85 Equipment

1. Fleet Vehicles

Following the teardown and inspection of the selected vehicles at BFLRF, new carburetors, fuel injectors, and spark plugs were purchased by BFLRF and used to reconvert the GM L-4 and V-6 engines back to use unleaded gasoline. In addition, new carburetors, fuel injectors, spark plugs, and written reconversion instructions were forwarded to Fort Ord to allow its maintenance personnel to reconvert all but one L-4 S-10 pickup and one V-6 Citation back to use unleaded gasoline. These two vehicles were the ones used at JPL for the engineering evaluations and later returned to the CARB Laboratory in El Monte, CA, for an additional emission test. Sierra Army Depot had expressed an interest in continuing to operate the Ford vehicles, which cannot easily be converted to use gasoline, in their regular transportation motor pool assignment. Therefore, the five Ford Escorts, one L-4 S-10 pickup, and one V-6 Citation were transferred to Sierra Army Depot where they will continue operation as M85 vehicles.

The Chrysler K-cars were returned to the Air Force (the SARPMA motor pool) after replacing the special Chrysler M85 engines with the original 2.2-liter gasoline engines removed earlier in the program.

2. M85 Equipment

Since Sierra Army Depot was the only post still using M85 fuel, all the M85 special equipment, pumps, tanks, including the 1200-gallon TPU unit at Fort Ord, hoses, dispensing nozzles, etc., were transferred to Sierra Army Depot for its use and storage.

The four M85 Chrysler engines are currently at Chrysler Engineering in Detroit, MI.

VII. RELATED EVALUATIONS

A. Chemical Analysis of Fuel Methanols

Congressional language in Section 202 of Public Law 98-525 also mandated that at least 50 percent of the methanol to be used in the tests should be derived from nonpetroleum sources. Therefore, a sample of methanol produced from coal was obtained for analysis. However, no coal-derived methanol was being commercially produced for use in the program; therefore, it was decided to use natural gas-derived methanol, which was commercially available. As a result, two samples of fuel methanols, one a coal-derived product and the other a natural gas-derived product, were obtained for analysis. Methanol derived from natural gas was assigned sample number AL-14737-F, while the methanol produced from coal was assigned sample number AL-14571-F. The fuel samples were analyzed for trace contaminants considered possible based on the chemical processes involved in production and those contaminants that may be present from shipping and handling. TABLE 13 presents the results of these analyses. The differences between the two samples are not considered to be significant. The higher zinc content sample, AL-14571, was received in a steel can, while sample AL-14337-F was received in glass containers. The container could account for the higher zinc content if the can were slightly zinc coated. The two samples were examined using gas chromatography and gas chromatography/mass selective detection. Both methanol samples were considered to be very pure, with only the coal-derived sample having 15 ppm of ethanol present. No contamination was detected that would affect the use of either methanol as a fuel for automotive engines. Detailed results of this investigation were reported earlier in Reference 3.

B. Cold-Start Evaluations

1. Laboratory Cold-Start Tests

During this part of the program, four Chevrolet S-10 pickups were transported to BFLRF and tested for cold starting performance. Two pickups were gasoline-fueled baseline vehicles, with one L-4 engine and one V-6 engine; two pickups were M85-fueled test vehicles, also with

TABLE 13. Analysis of Fuel Methanol for Trace Contaminants

Determination	Test Method	Coal-Derived Methanol (AL-14571-F)	Petroleum-Derived Methanol (AL-14737-F)	Limits of Detection
Water, Karl Fischer, wt%	D 1749	0.023	0.049	0.001
Nitrogen, Chemiluminescence, ppm	D 4629	<5	<5	5
Titratable Acid, meq/g	D 664	0.0003	0.00004	
Phosphorus, g/L	D 3231	ND*	ND	0.001
Sulfur, microcoulometric, ppm	D 3120	ND	ND	10
Chlorine, microcoulometric, ppm	D 3120	ND	ND	10
Trace Metals, ppb	AAS**			
Cr		ND	ND	5
Cu		2.5	12	5
Zn		130	10	5
Si		ND	ND	10
Mg		ND	ND	5
Al		ND	ND	5
Na		ND	ND	125
Pb, g/L	AAS	ND	ND	0.001

*ND = None Detected.
**AAS = Atomic Adsorption Spectroscopy

one L-4 engine and one V-6 engine. Both L-4 engines were 2.5-liter throttle body fuel-injected engines, while the 2.8-liter V-6 engines were both carbureted engines. Details of this laboratory program are reported in Reference 4.

All vehicles were tested in a refrigerated trailer capable of maintaining temperatures of ambient to 0°F (-18°C). Both gasoline vehicles started satisfactorily at temperatures of 0°F. The methanol vehicles were tested using M85 fuel, M82 fuel, SAE 40 engine oil, 10W-30 engine

oil, and, in one case, with a block heater. The V-6 engine started easier at lower temperatures than the L-4 engine. This easier starting was credited to the standard heated grid installed under the carburetor on the V-6, and the ability of the operator to control the initial mixture by using the accelerator pump on the V-6.

As shown in TABLE 14, useful minimum unaided starting temperature for the V-6 engine was approximately 20°F (-7°C) and 45°F (7°C) for the L-4 using M85 fuel and an SAE 40 engine oil. The use of M82 fuel lowers the starting temperatures by about 10 degrees for both engines. The L-4 engine was started successfully at 0°F using an electric heater installed in the cooling system.

TABLE 14. Results of Laboratory Cold-Start Tests
[Control Vehicles (Gasoline) Started at 0°F with SAE 40 Viscosity Grade Oil; Possibly Lower (Limit of Refrigeration Equipment)]

	Approximate Minimum* Starting Temperatures, °F	
Lubricant	L-4	V-6
M85, SAE 40 Lube	48	18
M85, 10W-30 Lube	37	19
M82, 10W-30 Lube	25	10
M85, 10W-30 Lube & Coolant Heater	<0	Not Tested

*Vehicles may start at lower temperatures with cranking times greater than 45 seconds.

2. Field Evaluation of Cold-Starting Capabilities

The cold-start capabilities of M85 engines were monitored from the actual operating histories of twenty Ford Escorts operated at the Sierra Army Depot during December 1986 through February 1987. During that period, seventeen no-starts were reported during days when the low ambient temperature ranges from 4°F (-16°C) to 30°F (-1°C). Twelve of the 17 reported no-starts were recorded for four specific vehicles, which indicates possible engine tune

problems, and/or lack of operator experience in the starting peculiarities of methanol-fueled vehicles. During this same time period, operational data from the remaining Ford Escorts show satisfactory starts and operation for a total of 105 vehicle dispatch days. In addition, 83 satisfactory vehicle dispatch days were recorded for the Ford Escorts when the low ambient temperatures of 0°F (-18°C) to 6°F (-14°C) were recorded. In general, satisfactory cold startability evaluations were more than demonstrated with operation of these vehicles. It should be noted that these vehicles performed satisfactorily even though they were using the special Ford Motorcraft SAE 20W-40 oil, which is not generally intended for use in cold weather environments. An SAE 10W-30 oil would have been the preferred viscosity grade for this environment, but was not available at that time from the Ford Methanol Group.

C. Methanol Refueling Stations

Phase I of the demonstration program was conducted at the Presidio of San Francisco using four M85 vehicles. JPL arranged to borrow a 500-gallon steel tank with a small electric pump and meter mounted on top of the tank from BofA. The tank-and-pump assembly was mounted on a flat bed truck such that the pump could be disconnected from the 120V power source and the truck driven to a BofA refueling station to be refilled with BofA specification fuel. The use of the BofA refueling unit was continued during Phase II of the demonstration program at the Presidio. New M85 refueling stations were installed at Fort Ord, Sierra Army Depot, and SARPMA by BFLRF. It was originally believed that an empty, in-ground steel fuel tank would be made available at Fort Ord for M85 use. In order to get the M85 portion of the demonstration program underway at Ford Ord, a 1000-gallon, double-walled steel tank with a California vapor return system was installed above ground. The double-walled tank was used to satisfy a regulation that requires a secondary retainment system necessary for all new fuel tank installations. A standard Tokheim, model 785-PR, service station-type pump and meter was modified by Shields, Harper Company, the pump supplier, to make all of the fuel-wetted pump parts compatible with M85. (Shields, Harper Company also supplies M85 fuel-dispensing pumps to the California Energy Commission for use in its M85 dispensing stations.) They did not disclose the details of all the modifications required except to say that some parts would require nickel plating and all of the gaskets and elastomers were replaced with Teflon®. M85-compatible dual vapor-return dispensing hose and filling nozzle was also required for the installation. Fig. 5 shows the M85 dispensing station at Fort Ord.

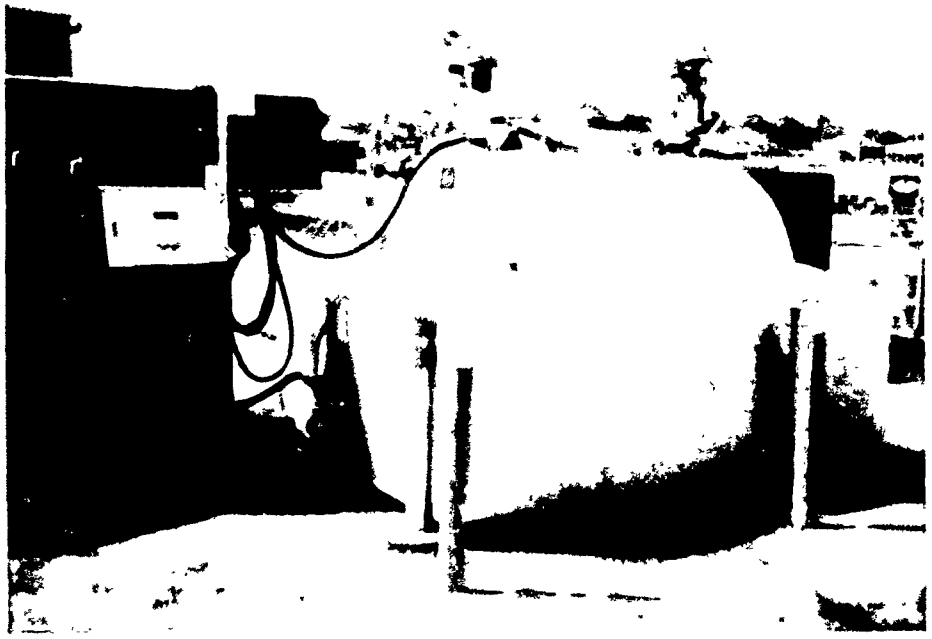

Figure 5. M85 dispensing station at Fort Ord

The in-ground tank originally thought to be available to the demonstration program was needed for other Fort Ord requirements and could not be used for the demonstration program. Belvoir Research, Development and Engineering Center formulated two solutions to this refueling deficiency--one short-term and one long-term. Both solutions utilized the standard 600-gallon aluminum fuel pod. A single-pod, gravity-feed fuel dispenser was quickly assembled at Belvoir RDE Center and shipped to Fort Ord. This dispenser used a single Buna-N hose mounted to a conventional service station nozzle. A totalizer and filter were also installed. Designed to mount on the back of a truck or on an elevated platform, the fuel dispenser could deliver fuel at the rate of 6 gpm. This apparatus was used for only a short time until more permanent equipment could be prepared. Belvoir RDE Center obtained three military Tank-and-Pump Units (TPUs)--truck-mounted refueling units intended for aircraft and ground equipment refueling at rates up to 50 gpm. Although TPUs usually contain two 600-gallon pods each, one of these units had only one. The TPUs were modified by a contractor (VSE Corp.) to be fully compatible with M85 and to dispense fuel at service station rates (around 12 gpm). All the elastomers had to be replaced, and new resetable totalizers and filters were installed (the TPU's Military Standard filter/separators proved unsatisfactory due to the deleterious effects of M85 on the coalescer elements). New dual hoses fabricated of Buna-N,

a vapor recovery system, and a California service station nozzle completed the redesign effort. The units were painted white to minimize the effects of solar heating. The total weight of a TPU filled with 1,200 gallons of M85 fuel exceeded the recommended load for a 5-ton truck (the military usually uses 10-ton trucks). As a result, special permission had to be granted from the personnel at Fort Ord to mount the units as shown in Fig. 6.

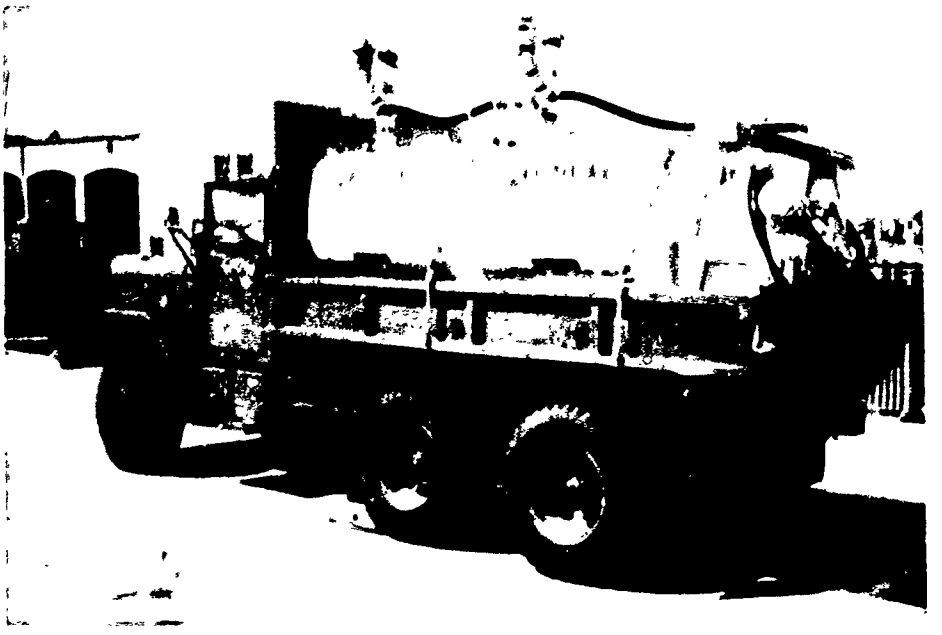

Figure 6. Tank-and-pump unit utilized at Fort Ord

The M85 storage and refueling facility installed at the Sierra Army Depot consisted of an above-ground 6,000-gallon, double-walled, steel tank and a modified Tokheim pump with dual, vapor-return dispensing hose and filling nozzle. Fig. 7 shows the M85 storage and refueling facility installed at the Sierra Army Depot by BFLRF. One problem arose during the purchase of the modified pump and dispensing hose and nozzle. The State of California passed a law eliminating the two-hose vapor return dispensing hose on all new fuel pumps purchased for installation in California, just prior to the Sierra Army Depot installation. All new installations were required to have a new dual-concentric hose and nozzle, and no dual-concentric hose compatible with M85 was available. The law was intended for gasoline-dispensing pumps, but no variances were allowed in the wording for the M85 fuel. After discussions with the pump supplier, the California Energy Commission, and the State of California officials, special permission was granted by the State of California to use the two-hose vapor return dispensing hose for the Sierra installation.

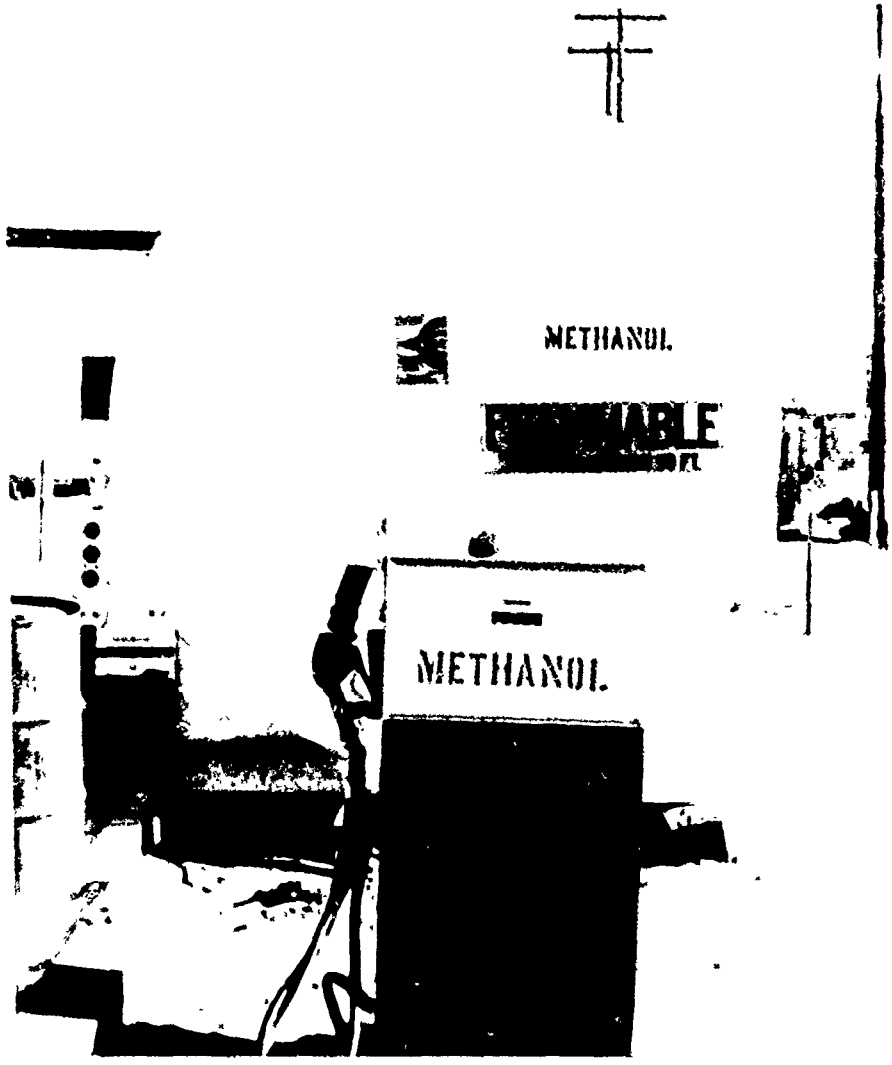

Figure 7. M85 Storage and refueling facility at Sierra Army Depot

The refueling facility installed at SARPMA was one of the 600-gallon TPU, similar in all respects but size to the unit at Fort Ord (Fig. 6), which was also furnished by Belvoir RDE Center.

D. Army's Tank-and-Pump (TPU) Validation Test

The TPUs furnished by Belvoir RDE Center for use in the M85 demonstration program were modified by a contractor to be compatible with M85 fuel prior to being shipped to Fort Ord and BFLRF.(10) However, previous work within the California Energy Commission's methanol fleet test program had surfaced an aluminum incompatibility problem with the

methanol fuel. Thus some unprotected aluminum alloys were reportedly not compatible with M85, resulting in aluminum oxide debris that will clog lines, filters, and other small passages such as one found in carburetors. Because of the chloride limitation established as a result of this incompatibility, JPL was reluctant to use the modified TPUs. Because of this concern by JPL, a validation test of a modified TPU was initiated at BFLRF to confirm the compatibility of the unit with M85.

One 600-gallon TPU unit was used in this test. To maximize potential for water condensation, the 12-week test was conducted during the summer months. Two hundred gallons of M85 fuel, blended to BofA specification, were pumped into the unshielded TPU storage tank. This fuel was circulated through the supplied flex lines and filter, using the unit pump, back to the fuel tank filler tube for 1 hour each day, except for weekends. A 1-gallon fuel sample was drawn from the bottom of the unit filter housing and analyzed for aluminum content once each 2 weeks for the 12-week period. The results of the analyses are shown in the listing on the left.

Test Weeks	Aluminum Content, ppb
2	16.6
4	14.6
6	35.0
8	55.0
10	44.0
12	53.0

An increase in the aluminum content of the fuel samples is shown, which could possibly be attributed to corrosion of the aluminum by the M85 fuel; however, keeping in mind that the aluminum content is presented in parts per billion and that the 1-gallon sample was taken from the bottom of the filter housing after circulating the fuel for 1 hour, it was not determined to be significant.

Since the primary objection to using the aluminum tank pump unit was the effect of possible corrosion debris on plugging fuel filters, orifices, etc., in the vehicle fuel systems, the iron content of a regular M85 sample received from the Fort Ord steel storage tank and a sample from one of the vehicle fuel tanks were evaluated as a comparison:

Sample	Iron Content, ppb
Fort Ord Steel Storage Tank	2,800
Fuel Tank of CM2890	4,000

The iron content of the two fuel samples that have caused no operational problems is considerably higher than that shown for the aluminum. Therefore, on the basis of these results, the 600-gallon TPU unit was deemed satisfactory for M85 storage.

E. Evaluation of Potential M85 Engine Oils

As shown in this report, the use of methanol fuel in current administrative-type vehicles results in increased wear and corrosion to vital engine parts. One method for possibly decreasing this wear and corrosion is the use of an improved lubricant formulation to offset the deleterious actions of the M85 fuel.

In an effort to determine the best lubricant for use in future government programs, a number of organizations were invited to submit oils that they believed would provide the added protection needed for M85-fueled engines. As a result, six oils were received (TABLE 15) and evaluated in an initial test series using modified ASTM Sequence V-D cyclic test conditions. Based upon wear metal debris in the used oil samples (TABLE 16), the three best oils were selected. A second test series was conducted on these three selected oils (AL-15427-L, AL-16155-L, and AL-15610-L) using steady-state/cold test conditions. TABLE 17 presents a summary of the total net used oil wear data obtained for steady-state/cold conditions. Since the results from these three lubricants provided the same order of protection from both cyclic and steady-state/cold conditions and the normalized percent of reference oil was within approximately ± 10 percent, all three of the better lubricants were recommended for use in future government programs using M85 fuel in administrative vehicles. Details of this portion of the program are reported earlier in Reference 5.

F. Emission Tests

The two GM vehicles subjected to engineering evaluation tests by JPL, one V-6 Citation and one L-4 S-10 pickup, were returned to the California Air Resources Board (CARB) laboratory in El Monte, CA, to be retested for emissions after accumulating approximately 10,000 miles on the V-6 engine using M85 fuel and 12,000 miles on the L-4 engine using M85 fuel. Fig. 8 presents a plot of the results obtained for the L-4 engine where they are compared with

TABLE 15. Analysis of Test Oils

BFLRF Oil Code	Viscosity at 40°C, cSt, D 445	Viscosity at 100°C, cSt, D 445	VI, D 2270	TAN, D 664	TBN, D 664
AL-14965-L	136.6	14.0	100	2.68	10.5
AL-14966-L	137.8	14.2	100	2.86	10.4
AL-15427-L	72.0	11.1	145	3.42	7.4
AL-15610-L	118.2	14.1	119	3.49	6.6
AL-16155-L	82.7*	10.4	104	2.49	15.0
AL-16156-L	78.8	10.0	107	2.45	14.5

* This candidate oil was used as the baseline "reference" oil in both cyclic and steady-state/cold test conditions to facilitate normalization of the test results. SwRI oil code LO-12119 was used as the flush oil for all tests.

TABLE 16. Summary of the Total Net Used Oil Wear Metal Data* for Each Test Conducted Under Cyclic Test Conditions

BFLRF Oil Code	Total Net, Wear Metal, ppm	Reference Oil Comparison Data	Normalized Percent of Reference Oil
AL-16155-L(a)	19	--	--
AL-16155-L(b)	116	116.0	100.0
AL-14965-L	134	116.3	115.2
AL-15427-L	107	116.6	91.8
AL-16155-L(b)	117	117.0	100.0
AL-16156-L	150	115.8	129.5
AL-15610-L	144	114.5	125.8
AL-14965-L	253	113.2	223.5
AL-16155-L(b)	112	112.0	100.0
AL-15427-L	82	100.5	81.6
AL-15610-L	98	89.0	110.1
AL-16156-L	104	77.5	134.2
AL-16155-L(b)	66	66.0	100.0
AL-14965-L	165	63.0	261.9
AL-15610-1	82	60.0	136.7
AL-14966-L	98	57.0	171.9
AL-16155-L(b)	54	54.0	100.0
AL-14966-L	63	51.0	123.5

*Total net wear metal equals 24-hr sample total data less new sample total data.
(a)Test conducted using Phillips "J" unleaded gasoline. All other tests conducted using M85 methanol fuel.
(b)Reference oil test.

TABLE 17. Summary of the Total Net Used Oil Wear Metal Data* for Each Test Conducted Under Steady-State/Cold Test Conditions

BFLRF Oil Code	Total Net, Wear Metal, ppm	Reference Oil Comparison Data	Normalized Percent of Reference Oil
AL-16155-L(a)	35	--	--
AL-16155-L(b)	341	341.0	100.0
AL-15427-L	264	290.3	90.9
AL-15610-L	209	239.7	87.2
AL-16155-L(b)	189	189.0	100.0
AL-15427-L	167	182.4	91.6
AL-15610-L	240	175.7	136.6
AL-16155-L(b)	169	169.0	100.0

*Total net wear metal equals 24-hr sample total data less new sample total data.
(a)Test conducted using Phillips "J" unleaded gasoline. All other tests conducted using M85 methanol fuel.
(b)Reference oil test.

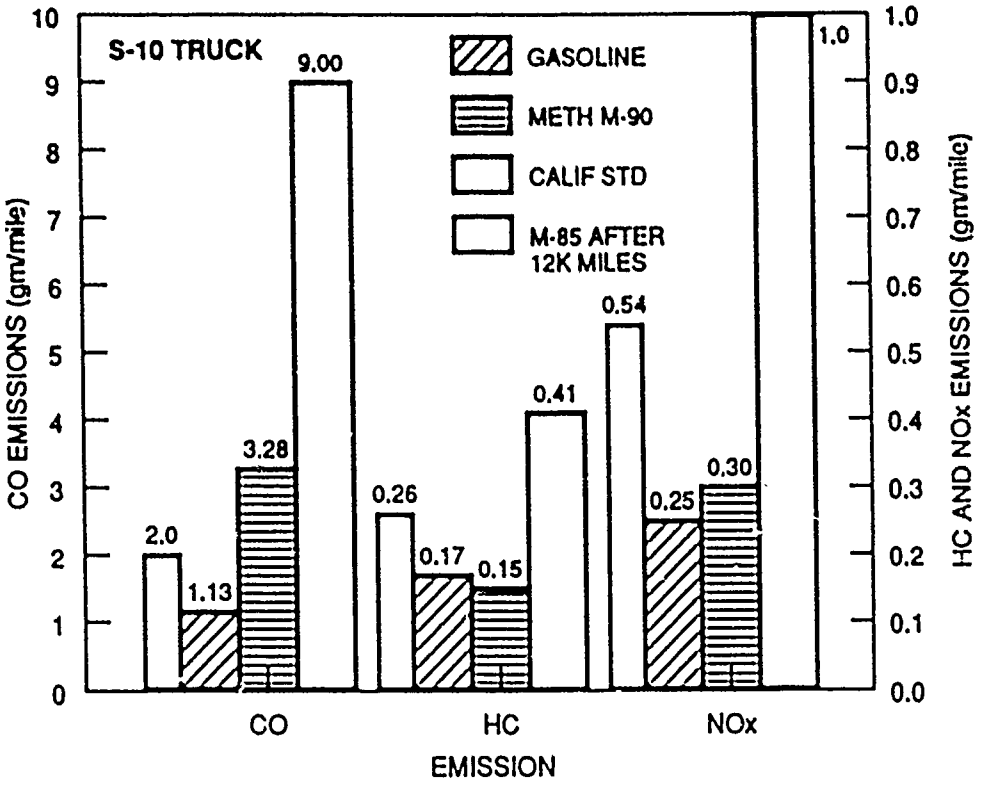

Figure 8. Exhaust emissions comparison for the L-4 engine

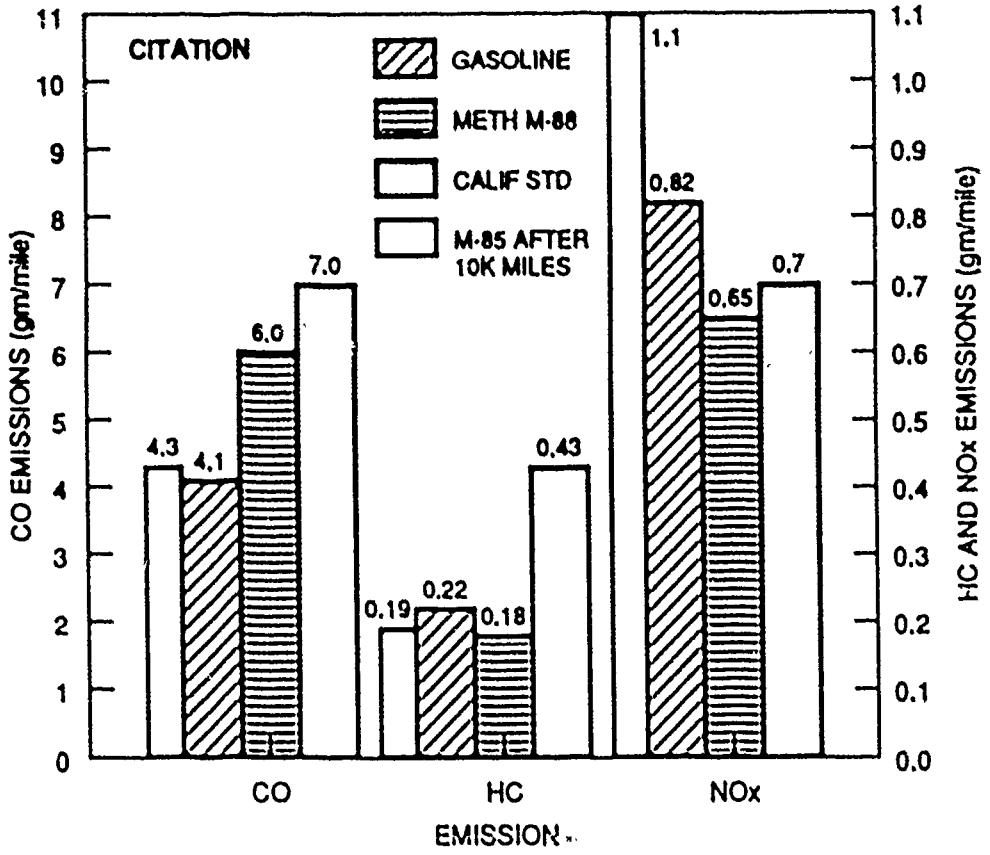

Figure 9. Exhaust emissions comparison for the V-6 engine

data presented earlier(1) by JPL during its initial engineering evaluations. The current values shown for CO, HC, and NO_X are all higher than those obtained just after the engine was converted to M85, but still well within the standard California requirements. Fig. 9 presents a plot of the results obtained for the V-6 engine where they too are compared with the data presented earlier (1) by JPL. The current results show very little change for the CO and HC values; however, NO_X increased from 0.82 to 1.1 g/mile. This value for NO_X was above the California standard of 0.7 g/mile. No additional CARB laboratory time was available at that time, so no effort was made to correct the NO_X value and return the V-6 Citation for a recheck.

G. Economic Assessment

The extra costs to operate M85 methanol-fueled vehicles, over the costs normally allowed for operating similar vehicles on unleaded gasoline, are generally covered when the following items are considered:

- The extra cost of a vehicle manufactured to operate on M85 fuel. This extra cost can be in the order of $2,000 per vehicle, and may be more if the vehicle is produced to operate on unleaded gasoline and M100 with no adjustments required by the operator. ($2,000 was the added cost of each of the 1983 M85 Ford Escorts produced for the State of California.)

- If an existing vehicle/engine is to be converted to use M85, using the BofA type conversion, hardware costs are estimated to be approximately $500, including plating the carburetor or fuel injectors, if required. In addition, it is estimated that approximately 24 hours of a senior technician's time would be required to make all the necessary changes, including reworking the carburetor fuel injectors. These changes would bring the cost of vehicle/engine conversion to approximately $1,500 for each vehicle.

- If the M85 fuel distribution infrastructure is not in place, a refueling station system would be required. A similar installation to that used at Sierra Army Depot would be recommended to service a fleet of 20 to 40 vehicles. A 6,000-gallon, double walled, steel saddle-mounted, above-ground tank, including a California vapor recovery system will cost approximately $9,350. The specially equipped Tokheim No. 785-PR dispensing pump with a meter and register, including all California Air Resources Board required vapor recovery system, pressure regulator valve, dispensing hoses and nozzle, will cost approximately $1,800 installed. The total cost of the dispensing station would therefore be approximately $11,100, assuming it was installed similar to the Sierra Army Depot system.

- Fuel Costs - M85 costs vary considerably. For example, M85 fuel cost to Fort Ord was $0.95 a gallon plus a delivery charge of $339.00, making a 1200-gallon (normal delivery size to Fort Ord) purchase cost $1,479, or $1.23 a gallon. Sierra Army Depot paid the same $0.95 a gallon plus the delivery charge of $339.00; however, Sierra purchased 6,000 gallons per delivery making their cost approximately $1.01 per gallon. The State of California had a contract with the same methanol supplier used by Fort Ord and Sierra Army Depot, and its cost was reported to be approximately 0.50 per gallon plus delivery charges. The

relatively small quantities purchased by the Army compared with that purchased by the State of California was reported as being the reason for the $0.45 less per gallon difference in the cost to the State of California.

Fort Ord was being charged $0.84 a gallon for the unleaded gasoline.

As an example, using the cumulative miles and the cumulative miles per gallon shown in TABLE 6 for the GM vehicles operated at Fort Ord on M85 fuel, a total of 35,419 gallons of M85 was used in the 23 M85 vehicles, at a fuel cost of $43,565. If the same miles had been accumulated using unleaded gasoline, approximately 17,076 gallons would have been required, at a gasoline cost of $14,344. Using these same data, the fuel cost, on a per mile basis, reduces to 13[cent] per mile using M85 fuel and 4.3 cents per mile using unleaded gasoline. It can be seen that, considering the difference in the cost of the two fuels and the differences in the economies obtained with the two fuels, using M85 increases the fuel costs by a factor of approximately 3.0.

- Engine Oil Costs - The engine oil cost for an M85 engine would be estimated to be about twice that of an engine operating on unleaded gasoline since the oil change interval recommended for M85 engines is about one-half that recommended for gasoline engines.

- When total maintenance costs of an M85 vehicle are compared with those of an equivalent gasoline vehicle, the results from this demonstration program indicate that very little difference, other than increased oil change requirements, are noted after the initial bugs" are eliminated from the methanol vehicle.

H. General Accounting Office (GAO) Evaluation of DOD's Methanol Vehicle Program

In early 1986, the chairman, Subcommittee on Energy and Power under the Committee on Energy and Commerce, tasked the General Accounting Office (GAO) to evaluate the Army's progress towards achieving the goals of the DOD Methanol-Fueled Administrative Vehicle

Demonstration Program. During subsequent months, GAO representatives interviewed a variety of Army personnel as well as personnel from JPL, BFLRF, California Energy Commission (CEC), and Bank of America. The resulting GAO report (11) was somewhat critical of the DOD program in drawing several inappropriate conclusions. Major points were:

- Objective of the demonstration effort was not to "stimulate" industry to produce methanol-compatible cars, but merely to demonstrate feasibility in utilizing existing technology within a military environment.

- Mileage accumulation of test vehicles proceeded slower than planned because of problems with fuel tank sender units supplied by BofA (i.e., drivers were hesitant to operate vehicles), the cooperative nature of this demonstration (i.e., using nondedicated drivers and vehicles), and unrealistic mileage accumulation goals initially established at the program's onset.

- Procurement of 1000 cars was never identified in DOD Authorization Bill as a goal.

The GAO report also questioned the ability to assess engine durability. The GAO criticism was based upon the sampling of vehicles and the anticipated accumulated mileage. It should be clearly understood that the DOD program was always intended to be a demonstration and not a designed test experiment. Further, the DOD program was initiated using essentially a conversion technology developed and "fielded" by BofA, which had accrued considerable mileage and experience in its methanol fuel fleet operation. The expansion of the DOD program to include the Ford Escorts again utilized a proven technology as these same vehicle types have accumulated more than 2,400,000 methanol fuel miles as part of CEC's fleet tests. The experience gained within both the BofA and CEC fleet programs was subsequently used in augmenting the engine durability assessments for the DOD program. Since no major problem has occurred at any of the four test sites, the DOD program did answer the engine durability request given in the 1985 DOD Appropriations Bill.

VIII. CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

The Army Methanol-Fueled Administrative Vehicle Demonstration Program was a complete success in that it showed:

- Methanol fuel (M85) can be utilized to extend short gasoline supplies. However, it requires that modifications be made to existing engine/vehicle fuel systems.

- Methanol fuel (M85) can successfully be utilized in modified existing engines, and/or engines designed to use methanol with very few problems as long as care is taken in the selection of fuel-wetted parts to ensure their compatibility with the methanol fuel.

- No significant increase in individual vehicle maintenance requirements, other than increased oil drains, was noted by any of the four groups responsible for the operational maintenance of the methanol vehicles.

- Even though indicated wear rates, from used oil samples analyses, obtained when using M85 fuel appear to be two to four times those obtained with similar engines using unleaded gasoline, actual wear, as evidenced by inspections and measurements, does not appear to be as severe as that indicated by the oil sample analyses.

- Fuel economy, in miles per gallon, obtained for vehicles using M85 fuel is shown to be approximately one-half that obtained in similar vehicles using regular unleaded gasoline.

- M85 refueling stations were set up and operated at each fleet site at just a slight increase in cost, due to the cost of pump modifications and hose requirements to ensure compatibility with M85, from that which would have been expended to set up new gasoline refueling stations.

- No operational problems, safety or otherwise, were encountered with any of the four M85 refueling stations.

- Methanol fuel (M85) costs, in larger quantities, can be as low as $0.50 per gallon. In the quantities purchased for this fleet program, the costs ranged from $0.86 to $0.95 per gallon plus transportation costs, which added approximately $340 to each delivery to Fort Ord and Sierra Army Depot.

- The extremely satisfactory results obtained during Phases I and II of the Army Methanol-Fueled Administrative Vehicle Demonstration Program precludes the necessity of continuing the program into the large Phase III originally planned.

B. Recommendations

Based upon the results obtained in Phases I and II of the Army Methanol-Fueled Administrative Vehicle Demonstration Program, the following items are recommended:

- Due to the successful completion of Phase I and II, it is recommended that the program be terminated and that Phase III of the originally planned program not be initiated.

- When it becomes necessary for the Army to have a fuel specification for M85 methanol fuel, it is recommended that the current State of California specification for M85 fuel be used as a model since no problems were encountered with its use in this program, and no proprietary materials are used in its formulation.

- Three lubricants, found to indicate decreased engine wear when using M85 fuel in one portion of the present program, are recommended for use in any future program using M85 as a motor fuel.

X. LIST OF REFERENCES

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6. "1.6 L Methanol Escort," Reference and Training Book, available from Ford Parts and Service Division, Training and Publications Department.

7. McGill, R.N., et al., "Results from the Second Year of Operation of the Federal Methanol Fleet at Argonne National Laboratory," ORNL Report ORNL/TM-11230, Martin Marietta Energy Systems, August 1989.

8. Bechtold, R.L., Timbario, T.J., et al., "Operating Experience of a Baltimore, Maryland/USA Fleet Using 90/10 Blend of Methanol/Unleaded Gasoline," paper received in private correspondence with T.J. Timbario of Mueller Associates, Inc.

9. Vann, L.G., et al., "California's Methanol Fleet Test Experience: Implementation and Lessons Learned," presented at the 1984 Washington Conference on Alcohol, November 15-16, 1984.

10. "Final Report-Prototype Methanol Pump and Tank Units," VSE Corp. Report No. VSE/ASG/0178-86/11RD, Contract No. DAAK70-81-D-0109, March 1986.

11. "Alternative Fuels, Information on DOD's Methanol Vehicle Program," General Accounting Office Report GAO/RCED-87-91, May 1987.

APPENDIX A

STATE OF CALIFORNIA FUEL SPECIFICATION FOR M85 METHANOL FUEL

APPENDIX A

STATE OF CALIFORNIA FUEL SPECIFICATION FOR M85 METHANOL FUEL

12/12/84

1.	METHANOL, By Volume, Min ASTM D 1152, 99.85% grade)	85.0%*

* The following test method shall be used when determining methanol-gasoline content.

ASTM D 3545 is to be modified for the determination of methanol, utilizing the gas chromatograph described therein. Acidity and water content results determined in 4 and 11 are to be used to normalize values obtained by gas chromatography. Note that the remaining portion of the fuel mixture is to be reported as gasoline.

2.	GASOLINE, PREMIUM UNLEADED, By Volume (ASTM D 439), 9-11 psi RVP Aromatics in Gasoline, 40% min. by volume, ASTM D 1319	14.5 ± 0.5%
3.	VAPOR PRESSURE, dry (ASTM D 323)	40-65 kPa
4.	ACIDITY, wt%, max (ASTM D 1613)	0.003%
5.	DISTILLATION RESIDUE, max (ASTM D 86)	0.5%
6.	TOTAL CHLORIDE CONTENT, ORGANIC AND INORGANIC, max (ASTM D 3120, Modified & ASTM D 2988)	0.0002%

ASTM D 3120 is modified for the determination of organic chlorides

7.	LEAD CONTENT, MAX (ASTM D 3237)	0.003 g/L
8.	PHOSPHORUS CONTENT, max (ASTM D 3231)	0.001 g/L
9.	SULFUR CONTENT, max (ASTM D 3120)	0.015%
10.	PARTICULATE CONTAMINANTS, max (ASTM D 2276)	0.1 g/L
11.	WATER, wt%, max (ASTM D 1744)	0.5%

APPENDIX B

LUBRICANT SAMPLING PROCEDURE FOR USE IN THE ARMY METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION PROGRAM

APPENDIX B

LUBRICANT SAMPLING PROCEDURE FOR USE IN THE ARMY METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION PROGRAM

Lubricant Samples

Purpose. Lubricant samples will be taken from each vehicle and evaluated to provide data with respect to lubricant quality, degradation, fuel dilution, lubricant additive depletion, and wear metal content.

Sampling Schedule. A new, unused oil sample will be obtained from the initial lubricant supply received for use in the methanol vehicles. Additional new, unused oil samples will be required if it is determined that a different batch or batches of the selected lubricant formulation is supplied later in the program.

A used engine oil sample will be drawn from each vehicle operating in Phase I and Phase II of the program once each 30 days or after each 1500 miles driven, whichever occurs first. A used engine oil sample will also be drawn just prior to each recommended oil change.

Sampling Procedure. The used engine oil sampling procedure will be the AOAP procedure using the Oil Sampling Pump Method, subparagraph 14d., page 3 of Technical Bulletin 43-0210. The equipment/supplies required for drawing the samples are given in Table 1, page 3 or TB 43-0210, dated 10 December 1984.

Shipping. BFLRF will provide the following items to each sampling activity in order to facilitate the rapid shipment of oil samples to BFLRF for analysis:

- Stick on labels for application to individual sample bottles with the required data documentation preprinted on the labels.

- Appropriate addressed shipping containers.

Analyses. Lubricant analyses by BFLRF will include, but not be limited to the following evaluations:

Evaluation	Method
Kinematic Viscosity, 40°C and 100°C	D 445
Total Acid No.	D-664
Total Base No.	D 2896
Fuel Dilution	by G.C.
Wear Metals Determination by	
ICP (Pb, Cu, Sn, Ai, Ni, Sb, Ag, Mn, Si, B, Mg, Ca, Ba, P, Zn, Fe, Cr)	Emission Spec.
Infrared Spectra	--

Reporting. The data obtained from the submitted samples will be reported by letter to JPL and the sampling activity, as a minimum, every 30 days if no significant changes in data are noted. In the event a significant change, for example a large increase in one or more wear metals, is noted, these data will be reported immediately by telephone to the sampling activity. In addition, it is planned that BFLRF personnel will visit each sampling activity on a regular basis, approximately once each month, to review the data generated, discuss any problems encountered in the program, and assist in solving any problems that may arise.

APPENDIX C

MONTHLY CUMULATIVE FUEL REPORTS FOR EACH VEHICLE

Monthly Cumulative Fuel Reports for Each Vehicle
at Presidio of San Francisco

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: PSFC '83 CHEV CITATION, 4 DOOR SEDAN
VEHICLE USA #: CK2364 ENGINE TYPE: L-4 PRESIDIO BASELINE VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
MAY	388	11.3	34.3	388	11.3	34.3
JUNE	1838	41.8	44.0	2226	53.1	41.9
JULY	1540	142.3	10.8	3766	195.4	19.3
AUGUST	1167	71.8	16.3	4933	267.2	18.5
SEPTEMBER	1207	59.2	20.4	6140	326.4	18.8
OCTOBER	1483	58.0	25.6	7623	384.4	19.8
NOVEMBER	2218	167.8	13.2	9841	552.2	17.8
DECEMBER	1298	117.3	11.1	11139	669.5	16.6
JANUARY	3079	196.5	15.7	14218	866.0	16.4
FEBRUARY	1154	51.7	22.3	15372	917.7	16.8
MARCH	2386	148.7	16.0	17758	1066.4	16.7
APRIL	2387	201.5	11.8	20145	1267.9	15.9
JUNE	368	0.0	0.0	20513	1267.9	16.2
JULY	749	43.9	17.1	21262	1311.8	16.2
AUGUST	1154	76.7	15.0	22416	1388.5	16.1
SEPTEMBER	2129	113.0	18.8	24545	1501.5	16.3
OCTOBER	1393	70.9	19.6	25938	1572.4	16.5
NOVEMBER	630	13.1	48.1	26568	1585.5	16.8
DECEMBER	669	43.4	15.4	27237	1628.9	16.7
JANUARY	2629	101.7	25.9	29866	1730.6	17.3
FEBRUARY	1404	91.5	15.3	31270	1822.1	17.2
MARCH	392	22.2	17.7	31662	1844.3	17.2
APRIL	754	58.1	13.0	32416	1902.4	17.0
MAY	573	21.7	26.4	32989	1924.1	17.1
JUNE	128	12.8	10.0	33117	1936.9	17.1
JULY	581	0.0	0.0	33698	1936.9	17.4

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: PSFC '83 CHEV CITATION, 4 DOOR SEDAN
VEHICLE USA #: CK2366 ENGINE TYPE: L-4 PRESIDIO BASELINE VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
SEPTEMBER	255	32.6	7.8	255	32.6	7.8
OCTOBER	183	9.2	20.3	438	40.8	10.7
NOVEMBER	2154	66.5	32.3	2591	107.3	12.8
DECEMBER	699	57.9	12.1	3290	165.2	14.4
JANUARY	7083	338.3	20.9	9366	503.5	14.9
FEBRUARY	768	64.6	11.9	7134	568.1	12.6
MARCH	1014	65.7	15.4	8148	633.8	12.9
APRIL	215	0.0	0.0	8363	633.8	13.2
MAY	457	37.2	12.3	8820	671.0	13.1
JUNE	888	29.2	30.4	9708	700.2	13.9
JULY	2405	121.6	19.8	12113	821.8	14.7
AUGUST	3339	161.6	20.7	15452	983.4	15.7
SEPTEMBER	2874	128.4	22.4	18326	1111.8	16.5
NOVEMBER	530	14.5	36.6	18856	1126.3	16.7
DECEMBER	1131	72.0	15.7	19987	1198.3	16.7
JANUARY	1685	110.4	15.3	21672	1308.7	16.6
MARCH	667	32.8	20.3	22339	1341.5	16.7
APRIL	1243	73.8	16.8	23582	1415.3	16.7
MAY	612	39.7	15.4	24194	1455.0	16.6

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: PSFC '84 CHEV CITATION, 4 DOOR SEDAN
VEHICLE USA #: CM3613 ENGINE TYPE: L-4 PRESIDIO METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
JUNE	3329	275.3	12.1	3329	275.3	12.1
JULY	3881	275.0	14.1	7210	550.3	13.1
AUGUST	4542	350.8	12.9	11752	901.1	13.0
SEPTEMBER	4703	326.5	14.4	16455	1227.6	13.4
OCTOBER	1511	140.3	10.8	17966	1367.9	13.1
NOVEMBER	732	87.5	8.4	18698	1455.4	12.8
MARCH	1736	129.5	13.4	20434	1584.9	12.9
APRIL	1117	167.8	6.7	21551	1752.7	12.3
MAY	1398	170.8	8.2	22949	1923.5	11.9
JUNE	693	11.7	59.2	23642	1935.2	12.2
JULY	2706	273.8	9.9	26348	2209.0	11.9
AUGUST	3571	312.7	11.4	29919	2521.7	11.9
SEPTEMBER	1139	65.6	17.4	31058	2587.3	12.0
NOVEMBER	1291	77.6	16.6	32349	2664.9	12.1
DECEMBER	1081	113.4	9.5	33430	2778.3	12.0
JANUARY	234	17.5	13.4	33664	2795.8	12.0
FEBRUARY	3134	219.7	14.3	36798	3015.5	12.2
MARCH	3071	306.0	10.0	39869	3321.5	12.0
APRIL	1931	193.1	10.0	41800	3514.6	11.9
MAY	1609	153.1	10.5	43409	3667.7	11.8
JUNE	1232	98.4	12.5	44641	3766.1	11.9

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: PSFC '84 CHEV CITATION, 4 DOOR SEDAN
VEHICLE USA #: CM3614 ENGINE TYPE: V-6 PRESIDIO METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
JUNE	1915	230.5	8.3	1915	230.5	8.3
JULY	3042	307.5	9.9	4957	538.0	9.2
AUGUST	2548	323.1	7.9	7505	861.1	8.7
SEPTEMBER	1810	196.5	9.2	9315	1057.6	8.8
OCTOBER	2116	212.6	10.0	11431	1270.2	9.0
NOVEMBER	726	112.5	6.5	12157	1382.7	8.8
DECEMBER	2950	344.6	8.6	15107	1727.3	8.7
JANUARY	3210	408.4	7.9	18317	2135.7	8.6
FEBRUARY	2812	313.6	9.0	21129	2449.3	8.6
MARCH	4022	444.6	9.0	25151	2893.9	8.7
APRIL	772	44.7	17.3	25923	2938.6	8.8
JUNE	1766	158.2	11.2	27689	3096.8	8.9
JULY	628	53.1	11.8	28317	3149.9	9.0
OCTOBER	2627	229.5	11.4	30944	3379.4	9.2
NOVEMBER	3269	310.5	10.5	34213	3689.9	9.3
DECEMBER	1869	180.8	10.3	36082	3870.7	9.3
JANUARY	1459	165.5	8.8	37541	4036.2	9.3
FEBRUARY	858	95.0	9.0	38399	4131.2	9.3
MARCH	1987	251.8	7.9	40386	4383.0	9.2
APRIL	2418	294.1	8.2	42804	4677.1	9.2
MAY	2067	223.8	9.2	44871	4900.9	9.2
JUNE	239	28.7	8.3	45110	4929.6	9.2

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: PSFC '84 CHEV CITATION, 4 DOOR SEDAN
VEHICLE USA #: CM3615 ENGINE TYPE: L-4 PRESIDIO METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
MAY	71	6.0	11.8	71	6.0	11.8
JUNE	3684	295.7	12.5	3755	301.7	12.4
JULY	3053	254.5	12.0	6808	556.2	12.2
AUGUST	4108	328.9	12.5	10916	885.1	12.3
SEPTEMBER	3850	256.1	15.0	14766	1141.2	12.9
OCTOBER	2566	214.9	11.9	17332	1356.1	12.8
NOVEMBER	690	95.8	7.2	18022	1451.9	12.4
DECEMBER	2003	261.8	7.7	20025	1713.7	11.7
FEBRUARY	2608	316.3	8.2	22633	2030.0	11.1
MARCH	2112	259.9	8.1	24745	2289.9	10.8

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: PSFC '83 CHEV CITATION, 4 DOOR SEDAN
VEHICLE USA #: CM3616 ENGINE TYPE: V-6 PRESIDIO METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
JUNE	2700	245.1	11.0	2700	245.1	11.0
JULY	2215	229.9	9.6	4915	475.0	10.3
AUGUST	1254	122.0	10.3	6169	597.0	10.3
SEPTEMBER	982	129.4	7.6	7151	726.4	9.8
OCTOBER	1424	114.7	12.4	8575	841.1	10.2
NOVEMBER	1265	165.2	7.7	9840	1006.3	9.8
DECEMBER	696	79.4	8.8	10536	1085.7	9.7
JANUARY	1333	178.3	7.5	11869	1264.0	9.4
FEBRUARY	990	110.6	9.0	12859	1374.6	9.4
MARCH	1508	145.8	10.3	14367	1520.4	9.4
APRIL	1329	143.5	9.3	15696	1663.9	9.4
MAY	995	142.1	7.0	16691	1806.0	9.2
JUNE	1504	156.1	9.6	18195	1962.1	9.3
JULY	1233	99.0	12.5	19428	2061.1	9.4
AUGUST	695	44.3	15.7	20123	2105.4	9.6
SEPTEMBER	1114	70.9	15.7	21237	2176.3	9.8
OCTOBER	1227	117.9	10.4	22464	2294.2	9.8
NOVEMBER	1413	96.2	14.7	23877	2390.4	10.0
DECEMBER	661	19.1	34.6	24538	2409.5	10.2
JANUARY	670	18.7	35.8	25208	2428.2	10.4
MARCH	57	0.0	0.0	25265	2428.2	10.4
APRIL	746	49.6	15.0	26011	2477.8	10.5
MAY	964	57.4	16.8	26975	2535.2	10.6
JUNE	857	43.8	19.6	27832	2579.0	10.8
JULY	1000	38.3	26.1	28832	2617.3	11.0

Monthly Cumulative Fuel Reports for Each Vehicle at Fort Ord

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA '85 CHEV S-10 PICKUP
VEHICLE USA #: CM2884 ENGINE TYPE: V-6 FT. ORD BASELINE VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
MAY	277	0.0	0.0	277	0.0	0.0
JUNE	348	27.0	12.9	625	27.0	23.1
JULY	485	31.1	15.6	1110	58.1	19.1
AUGUST	1105	65.2	16.9	2215	123.3	18.0
SEPTEMBER	779	44.6	17.5	2994	167.9	17.8
OCTOBER	483	26.2	18.4	3477	194.1	17.9
NOVEMBER	255	19.1	13.4	3732	213.2	17.5
DECEMBER	750	20.2	37.1	4482	233.4	19.2
JANUARY	984	30.7	32.1	5466	264.1	20.7
FEBRUARY	335	14.0	23.9	5801	278.1	20.9
MARCH	279	13.1	21.3	6080	291.2	20.9
OCTOBER	665	38.4	17.3	6745	329.6	20.5
NOVEMBER	235	14.7	16.0	6980	344.3	20.3
DECEMBER	320	14.5	22.1	7300	358.8	20.3
JANUARY	255	7.5	34.0	7555	366.3	20.6
FEBRUARY	205	20.0	10.3	7760	386.3	20.1
MARCH	327	17.3	18.9	8087	403.6	20.0
APRIL	442	23.1	19.1	8529	426.7	20.0
MAY	383	31.0	12.4	9912	457.7	19.5
JUNE	402	25.4	15.8	9314	483.1	19.3
JULY	817	59.4	13.8	10131	542.5	18.7
AUGUST	1244	58.7	21.2	11375	601.2	18.9
SEPTEMBER	1358	75.2	18.1	12733	676.4	18.8
OCTOBER	1234	51.3	24.1	13967	727.7	19.2
NOVEMBER	1162	49.9	23.3	15129	777.6	19.5

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA '85 CHEV S-10 PICKUP
VEHICLE USA /, CM2985 ENGINE TYPE: V-6 FT. ORD BASELINE VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
MAY	247	19.0	13.0	247	19.0	13.0
JUNE	748	37.8	19.8	995	56.8	17.5
JULY	546	39.5	13.8	1541	96.3	16.0
AUGUST	815	36.9	22.1	2356	133.2	17.7
SEPTEMBER	753	45.7	16.5	3109	178.9	17.4
OCTOBER	799	38.5	18.2	3908	217.4	17.5
NOVEMBER	533	34.5	15.4	4341	251.9	17.2
DECEMBER	805	38.0	21.2	5146	289.9	17.8
JANUARY	540	38.0	14.2	5686	327.9	17.3
FEBRUARY	569	38.6	14.7	6255	366.5	17.1
MARCH	433	23.7	18.3	6688	390.2	17.1
APRIL	540	36.2	14.9	7228	426.4	17.0
MAY	516	32.1	16.1	7744	458.5	16.9
JUNE	632	33.0	19.2	8376	491.5	17.0
JULY	906	47.9	18.9	9282	539.4	17.2
AUGUST	734	42.5	17.3	10016	581.9	17.2
SEPTEMBER	687	38.0	18.1	10703	619.9	17.3
OCTOBER	616	25.3	24.3	11319	645.2	17.5
NOVEMBER	431	23.0	18.7	11750	668.2	17.6
DECEMBER	319	28.9	11.0	12069	697.1	17.3
JANUARY	564	29.0	19.4	12633	726.1	17.4
FEBRUARY	516	38.4	13.4	13149	764.5	17.2
MARCH	566	38.9	14.6	13715	803.4	17.1
APRIL	701	46.1	15.2	14416	849.5	17.0
MAY	526	28.9	18.2	14942	878.4	17.0
JUNE	411	20.2	20.3	15353	898.6	17.1
JULY	485	27.5	17.6	15838	926.1	17.1
AUGUST	385	31.0	12.4	16223	957.1	17.0
SEPTEMBER	558	29.7	18.8	16781	986.8	17.0
OCTOBER	494	31.3	15.8	17275	1018.1	17.0
NOVEMBER	529	39.2	13.5	17804	1057.3	16.8
DECEMBER	95	14.3	6.6	17899	1071.6	16.7

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA '85 CHEV S-10 PICKUP
VEHICLE USA #: CM2890 ENGINE TYPE: L-4 FT. ORD BASELINE VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
MAY	27	0.0	0.0	27	0.0	0.0
JUNE	1116	64.0	17.4	1143	64.0	17.9
JULY	1183	60.6	19.5	2326	124.6	18.7
AUGUST	1006	47.0	21.4	3332	171.6	19.4
SEPTEMBER	1046	66.0	15.8	4378	237.6	18.4
OCTOBER	1230	61.0	20.2	5608	298.6	18.8
NOVEMBER	912	60.0	15.2	6520	358.6	18.2
DECEMBER	708	48.2	14.7	7228	406.8	17.8
JANUARY	610	29.3	20.8	7838	436.1	18.0
FEBRUARY	338	21.8	15.5	8176	457.9	17.9
MARCH	115	9.4	12.2	8291	467.3	17.7
OCTOBER	471	35.7	13.2	8762	503.0	17.4
NOVEMBER	418	26.5	15.8	9180	529.5	17.3
DECEMBER	401	17.3	23.2	9581	546.8	17.5
JANUARY	234	8.0	29.3	9815	554.8	17.7
FEBRUARY	647	47.1	13.7	10462	601.9	17.4
MARCH	658	44.1	14.9	11120	646.0	17.2
APRIL	559	37.6	14.9	11679	683.6	17.1
MAY	481	32.5	14.8	12160	716.1	17.0
JUNE	1358	97.4	13.9	13518	813.5	16.6
JULY	1091	58.2	18.7	14609	871.7	16.8
AUGUST	895	40.3	22.2	15504	912.0	17.0
SEPTEMBER	944	50.2	18.8	16448	962.2	17.1
OCTOBER	1265	63.3	20.0	17713	1025.5	17.3
NOVEMBER	909	44.5	20.4	18622	1070.0	17.4

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA '85 CHEV S-10 PICKUP
VEHICLE USA #: CM2878 ENGINE TYPE: L-4 FT. ORD METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
MAY	344	13.0	26.5	344	13.0	26.5
JUNE	850	30.8	27.6	1194	43.8	27.3
JULY	651	34.9	18.7	1845	78.7	23.4
AUGUST	807	43.8	18.4	2652	122.5	21.6
SEPTEMBER	745	38.9	19.2	3397	161.4	21.0
OCTOBER	377	14.7	25.6	3774	176.1	21.4
NOVEMBER	483	25.9	18.6	4257	202.0	21.1
DECEMBER	428	24.1	17.8	4685	226.1	20.7
JANUARY	523	8.8	59.4	5208	234.9	22.2
FEBRUARY	171	0.0	0.0	5379	234.9	22.9
CONVERTED TO METHANOL						
MARCH	467	49.3	9.5	467	49.3	9.5
APRIL	864	79.0	8.4	1131	128.3	8.8
MAY	408	29.9	13.6	1539	158.2	9.7
JUNE	453	43.4	10.4	1992	201.6	9.9
JULY	566	59.7	9.5	2558	261.3	9.8
AUGUST	545	65.0	8.4	3103	326.3	9.5
SEPTEMBER	506	31.0	16.3	3609	357.3	10.1
OCTOBER	438	45.4	9.6	4047	402.7	10.0
NOVEMBER	484	45.8	10.6	4531	448.5	10.1
DECEMBER	553	43.5	12.7	5084	492.0	10.3
JANUARY	403	0.0	0.0	5487	492.0	11.2
FEBRUARY	423	44.9	9.4	5910	536.9	11.0
MARCH	565	69.5	8.1	6475	606.4	10.7
APRIL	547	43.9	12.5	7022	650.3	10.8
MAY	749	38.0	19.7	7771	688.3	11.3
JUNE	593	71.2	8.3	8364	759.5	11.0
JULY	472	43.5	10.9	8836	803.0	11.0
AUGUST	561	65.5	8.6	9397	868.5	10.8
SEPTEMBER	512	43.5	11.8	9909	912.0	10.9
OCTOBER	315	15.4	20.5	10224	927.4	11.0
NOVEMBER	403	42.6	9.5	10627	970.0	11.0
DECEMBER	655	55.0	11.9	11282	1025.0	11.0
JANUARY	681	78.4	8.7	11963	1103.4	10.8
FEBRUARY	631	68.4	9.2	12594	1171.8	10.7
MARCH	508	52.4	9.7	13102	1224.2	10.7

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST ACTIVITY: FOCA '85 CHEV S-10 PICKUP
VEHICLE USA #: CM2879 ENGINE TYPE: L-4 FT. ORD METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
MAY	3	0.0	0.0	3	0.0	0.0
JUNE	710	39.3	18.1	713	39.3	18.1
JULY	803	32.9	24.4	1516	72.2	21.0
AUGUST	545	34.5	15.8	2061	106.7	19.3
SEPTEMBER	538	37.9	14.2	2599	144.6	18.0
OCTOBER	526	23.7	22.2	3125	168.3	18.6
NOVEMBER	400	22.6	17.7	3525	190.9	18.5
DECEMBER	365	27.6	13.2	3890	218.5	17.8
JANUARY	432	26.7	16.2	4322	245.2	17.6
FEBRUARY	431	27.3	15.8	4753	272.5	17.4
MARCH	83	0.0	0.0	4836	272.5	17.7
CONVERTED TO METHANOL						Mid-Month
MARCH	16	10.0	1.6	16	10.0	1.6
APRIL	235	36.5	6.4	251	46.5	5.4
MAY	364	33.6	10.8	615	80.1	7.7
JUNE	288	38.5	7.5	903	118.6	7.6
JULY	583	64.6	9.0	1486	183.2	8.1
AUGUST	588	45.9	12.8	2074	229.1	9.1
SEPTEMBER	558	63.3	8.8	2632	292.4	9.0
OCTOBER	640	55.9	11.4	3272	348.3	9.4
NOVEMBER	849	80.4	10.6	4121	428.7	9.6
DECEMBER	587	53.1	12.9	4908	481.8	10.0
JANUARY	1128	59.3	19.0	5936	541.1	11.0
FEBRUARY	609	50.3	12.1	6545	591.4	11.1
MARCH	1163	109.3	10.6	7708	700.7	11.0
APRIL	549	53.6	10.2	8257	754.3	10.9
MAY	591	66.4	8.9	8848	820.7	10.8
JUNE	597	63.6	9.4	9445	884.3	10.7
JULY	697	78.0	8.9	10142	962.3	10.5
AUGUST	543	34.0	16.0	10685	996.3	10.7
SEPTEMBER	545	58.2	9.4	11230	1054.5	10.6
OCTOBER	433	43.4	10.0	11663	1097.9	10.6
NOVEMBER	368	36.9	10.0	12031	1134.8	10.6
DECEMBER	106	7.0	15.1	12137	1141.8	10.6

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA '85 CHEV S-10 PICKUP
VEHICLE USA #: CM2980 ENGINE TYPE: V-6 FT. ORD METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
MAY	280	9.5	29.5	280	9.5	29.5
JUNE	698	32.5	18.4	978	42.0	20.9
JULY	814	54.6	16.7	1792	96.6	18.6
AUGUST	1264	59.0	21.4	3056	154.6	19.8
SEPTEMBER	1056	36.2	29.2	4112	190.8	21.6
OCTOBER	575	35.2	16.3	4687	226.0	20.7
NOVEMBER	542	25.5	21.3	5229	251.5	20.8
DECEMBER	1308	74.3	17.6	6537	325.8	20.1
JANUARY	48	0.0	0.0	6585	325.8	20.2
CONVERTED TO METHANOL						
FEBRUARY	519	69.6	7.5	519	69.6	7.5
MARCH	1430	147.7	9.7	1949	217.3	9.0
APRIL	993	123.3	8.1	2942	340.6	8.6
MAY	670	65.0	10.3	3612	405.6	8.9
JUNE	820	94.3	8.7	4432	499.9	8.9
JULY	920	101.8	9.0	5352	601.7	8.9
AUGUST	613	70.0	8.8	5965	671.7	8.9
SEPTEMBER	904	114.2	7.9	6869	785.9	8.7
OCTOBER	559	62.6	8.9	7428	848.5	8.8
NOVEMBER	1284	114.7	11.2	8712	963.2	9.0
DECEMBER	867	86.5	10.0	9579	1049.7	9.1
JANUARY	618	74.5	8.3	10197	1124.2	9.1
FEBRUARY	673	60.5	11.2	10875	1184.7	9.2
MARCH	598	88.7	6.7	11473	1273.4	9.0
APRIL	1535	129.9	11.8	13008	1403.3	9.3
MAY	1117	102.9	10.9	14125	1506.2	9.4
JUNE	872	77.8	11.2	14997	1584.0	9.5
JULY	603	78.8	7.7	15600	1662.8	9.4
AUGUST	905	90.7	10.0	16505	1753.5	9.4
SEPTEMBER	463	49.9	9.3	16968	1803.4	9.4
OCTOBER	634	66.0	9.6	17602	1869.4	9.4
NOVEMBER	445	41.0	10.9	18047	1910.4	9.4
DECEMBER	389	59.0	6.6	18436	1969.4	9.4
JANUARY	599	56.6	10.6	19035	2026.0	9.4
FEBRUARY	527	49.1	10.7	19562	2075.1	9.4
MARCH	349	60.6	5.8	19911	2135.7	9.3
FEBRUARY	43	0.0	0.0	19954	2135.7	9.3

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA '85 CHEV S-10 PICKUP
VEHICLE USA #: CM2991 ENGINE TYPE: V-6 FT. ORD METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
JUNE	1345	57.9	23.2	1345	57.9	23.2
JULY	725	27.0	26.5	2070	84.9	24.4
AUGUST	311	41.6	19.5	2381	126.5	22.8
SEPTEMBER	389	30.4	29.2	3770	156.9	24.0
OCTOBER	369	39.8	9.3	4139	196.7	21.0
NOVEMBER	309	18.8	16.4	4448	215.5	20.6
DECEMBER	191	17.7	10.8	4639	233.2	19.9
JANUARY	41	0.0	0.0	4680	233.2	20.1
CONVERTED TO METHANOL						
FEBRUARY	258	39.8	6.5	258	39.8	6.5
MARCH	551	70.1	7.9	809	109.9	7.4
APRIL	638	82.7	7.7	1447	192.6	7.5
MAY	620	67.3	9.2	2067	259.9	8.0
JUNE	253	36.8	6.9	2320	296.7	7.8
JULY	417	58.8	7.1	2737	355.5	7.7
AUGUST	335	42.6	7.9	3072	398.1	7.7
SEPTEMBER	467	70.5	6.6	3539	468.6	7.6
OCTOBER	458	65.2	7.0	3997	533.8	7.5
NOVEMBER	450	52.8	8.5	4447	586.6	7.6
DECEMBER	407	57.6	7.1	4854	644.2	7.5
JANUARY	443	73.8	6.0	5297	718.0	7.4
FEBRUARY	458	138.0	3.3	5755	856.0	6.7
MARCH	622	91.3	6.8	6377	947.3	6.7
APRIL	524	58.0	9.0	6901	1005.3	6.9
MAY	506	77.2	6.6	7407	1082.5	6.8
JUNE	416	50.7	8.2	7823	1133.2	6.9
JULY	688	96.7	7.1	8511	1229.9	6.9
AUGUST	771	82.2	9.4	9282	1312.1	7.1
SEPTEMBER	859	63.8	13.5	10141	1375.9	7.4
OCTOBER	122	32.2	3.8	10263	1408.1	7.3
NOVEMBER	316	87.3	3.6	10579	1495.4	7.1
DECEMBER	612	90.3	6.8	11191	1585.7	7.1
JANUARY	679	118.6	5.7	11870	1704.3	7.0
FEBRUARY	733	83.9	8.7	12603	1788.2	7.0
MARCH	564	85.5	6.6	13167	1873.7	7.0

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA '85 CHEV S-10 PICKUP
VEHICLE USA #: CM2982 ENGINE TYPE: V-6 FT. ORD METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
MAY	369	6.8	54.3	369	6.8	54.3
JUNE	849	53.5	15.9	1218	60.3	20.2
JULY	1078	53.4	20.2	2296	113.7	20.2
AUGUST	984	51.7	19.0	3280	165.4	19.8
SEPTEMBER	685	33.5	20.4	3965	198.9	19.9
OCTOBER	776	48.7	15.9	4741	247.6	19.1
NOVEMBER	513	25.9	19.8	5254	273.5	19.2
DECEMBER	1207	62.0	19.5	6461	335.5	19.3
JANUARY	131	11.0	11.9	6592	346.5	19.0
CONVERTED TO METHANOL						
FEBRUARY	446	38.0	11.7	446	38.0	11.7
MARCH	1186	129.7	9.1	1632	167.7	9.7
APRIL	896	103.0	8.7	2528	270.7	9.3
MAY	340	36.8	9.2	2868	307.5	9.3
JUNE	456	57.5	7.9	3324	365.0	9.1
JULY	563	67.4	8.4	3887	432.4	9.0
AUGUST	551	63.7	8.6	4438	496.1	8.9
SEPTEMBER	678	64.4	10.5	5116	560.5	9.1
OCTOBER	534	59.9	8.9	5650	620.4	9.1
NOVEMBER	729	77.3	9.4	6379	697.7	9.1
DECEMBER	397	51.4	7.7	6776	749.1	9.0
JANUARY	539	56.2	9.6	7315	805.3	9.1
FEBRUARY	506	42.0	12.0	7821	847.3	9.2
MARCH	638	91.6	7.0	8459	938.9	9.0
APRIL	690	77.9	8.9	9149	1016.8	9.0
MAY	419	62.3	6.7	9568	1079.1	8.9
JUNE	641	60.0	10.7	10209	1139.1	9.0
JULY	766	95.7	8.0	10975	1234.8	8.9
AUGUST	636	81.8	7.8	11611	1316.6	8.8
SEPTEMBER	606	72.5	8.4	12217	1389.1	8.8
OCTOBER	5	0.0	0.0	12222	1389.1	8.8
NOVEMBER	128	17.8	7.2	12350	1406.9	8.8
DECEMBER	483	62.1	7.8	12833	1469.0	8.7
JANUARY	636	95.1	6.7	13469	1564.1	8.6
FEBRUARY	694	104.4	6.6	14163	1668.5	8.5
MARCH	707	68.9	10.3	14870	1737.4	8.6

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA '85 CHEV S-10 PICKUP
VEHICLE USA #: CM2883 ENGINE TYPE: L-4 FT. ORD METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
MAY	235	9.3	25.3	235	9.3	25.3
JUNE	1334	53.0	25.2	1569	62.3	25.2
JULY	819	40.1	20.4	2388	102.4	23.3
AUGUST	958	47.1	20.3	3346	149.5	22.4
SEPTEMBER	680	34.5	19.7	4026	184.0	21.9
OCTOBER	436	27.7	15.7	4462	211.7	21.1
NOVEMBER	288	16.6	17.3	4750	228.3	20.8
DECEMBER	141	11.8	11.9	4891	240.1	20.4
JANUARY	794	34.1	23.3	5685	274.2	20.7
FEBRUARY	272	4.0	68.0	5957	278.2	21.4
CONVERTED TO METHANOL						
MARCH	257	38.3	6.7	257	38.3	6.7
APRIL	98	0.0	0.0	355	38.3	9.3
MAY	351	55.0	6.4	706	93.3	7.6
JUNE	546	60.0	9.1	1252	153.3	8.2
JULY	500	57.8	8.7	1752	211.1	8.3
AUGUST	409	31.4	13.0	2161	242.5	8.9
SEPTEMBER	681	99.5	6.8	2842	342.0	8.3
OCTOBER	530	55.3	9.6	3372	397.3	8.5
NOVEMBER	485	50.3	9.6	3857	447.6	8.6
DECEMBER	390	41.8	9.3	4247	489.4	8.7
JANUARY	7	0.0	0.0	4254	489.4	8.7
MARCH	183	25.0	7.3	4437	514.4	8.6
APRIL	698	102.7	6.8	5135	617.1	8.3
MAY	969	109.0	8.9	6104	726.1	8.4
JUNE	517	59.7	8.7	6621	785.8	8.4
JULY	510	57.0	8.9	7131	842.8	8.5
AUGUST	461	44.3	10.4	7592	887.1	8.6
SEPTEMBER	220	23.5	9.4	7812	910.6	8.6
OCTOBER	412	47.2	8.7	8224	957.8	8.6
NOVEMBER	322	40.0	8.0	8546	997.8	8.6
DECEMBER	94	0.0	0.0	8640	997.8	8.7

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA '85 CHEV S-10 PICKUP
VEHICLE USA #: CM2986 ENGINE TYPE: V-6 FT. ORD METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
MAY	74	0.0	0.0	74	0.0	0.0
JUNE	767	52.0	14.8	841	52.0	16.2
JULY	1553	73.5	21.1	2394	125.5	19.1
AUGUST	1880	71.0	26.5	4274	196.5	21.8
SEPTEMBER	477	14.0	34.1	4751	210.5	22.6
CONVERTED TO METHANOL						
JANUARY	564	25.8	21.9	564	25.8	21.9
FEBRUARY	375	33.4	11.2	939	59.2	15.9
MARCH	1052	104.0	10.1	1991	163.2	12.2
APRIL	893	109.4	8.2	2884	272.6	10.6
MAY	708	81.7	8.7	3592	354.3	10.1
JUNE	649	58.3	11.1	4241	412.6	10.3
JULY	533	85.1	6.3	4774	497.7	9.6
AUGUST	1041	142.9	7.3	5815	640.6	9.1
SEPTEMBER	674	75.8	8.9	6489	716.4	9.1
OCTOBER	854	99.3	8.6	7343	815.7	9.0
NOVEMBER	357	26.2	13.6	7700	841.9	9.1
DECEMBER	440	66.5	6.6	8140	908.4	9.0
JANUARY	428	37.4	11.4	8568	945.8	9.1
FEBRUARY	413	47.0	8.8	8981	992.8	9.0
MARCH	503	58.1	8.7	9484	1050.9	9.0
APRIL	377	30.3	12.4	9861	1081.2	9.1
MAY	349	80.5	4.3	10210	1161.7	8.8
JUNE	505	54.0	9.4	10715	1215.7	8 8
JULY	368	68.6	5.4	11083	1284.3	8.6
AUGUST	497	56.6	8.8	11580	1340.9	8.6
SEPTEMBER	382	67.4	5.7	11962	1408.3	8.5
OCTOBER	441	50.8	8.7	12403	1459.1	8.5
NOVEMBER	382	37.3	10.2	12785	1496.4	8.5
DECEMBER	394	62.1	6.3	13179	1558.5	8.5
JANUARY	696	65.7	10.6	13875	1624.2	8.5
FEBRUARY	485	75.4	6.4	14360	1699.6	8.4
MARCH	220	31.6	7.0	14580	1731.2	8.4

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA '95 CHEV S-10 PICKUP
VEHICLE USA #: CM2887 ENGINE TYPE: V-6 FT. ORD METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
MAY	17	0.0	0.0	17	0.0	0.0
JUNE	1038	52.9	19.6	1055	52.9	19.9
JULY	932	42.9	21.7	1987	95.8	20.7
AUGUST	1020	58.7	17.4	3007	154.5	19.5
SEPTEMBER	947	49.5	19.1	3954	204.0	19.4
OCTOBER	542	35.1	15.4	4496	239.1	18.8
NOVEMBER	514	32.8	15.7	5010	271.9	18.4
DECEMBER	407	22.9	17.8	5417	294.8	18.4
JANUARY	29	0.0	0.0	5446	294.8	18.5
CONVERTED TO METHANOL						
FEBRUARY	106	11.0	9.6	106	11.0	9.6
MARCH	477	71.9	6.6	583	82.9	7.0
APRIL	305	35.3	8.6	888	118.2	7.5
MAY	417	63.7	6.5	1305	181.9	7.2
JUNE	273	43.0	6.3	1578	224.9	7.0
JULY	365	49.9	7.3	1943	274.8	7.1
AUGUST	309	46.1	6.7	2252	320.9	7.0
SEPTEMBER	414	60.9	6.8	2666	381.8	7.0
OCTOBER	780	115.0	6.8	3446	496.8	6.9
NOVEMBER	796	92.2	8.6	4242	589.0	7.2
DECEMBER	793	81.5	9.7	5035	670.5	7.5
JANUARY	1408	115.7	12.2	6443	786.2	8.2
FEBRUARY	1067	103.7	10.3	7510	889.9	8.4
MARCH	1067	118.1	9.0	8577	1008.0	8.5
APRIL	805	73.6	10.9	9382	1081.6	8.7
MAY	1108	85.8	12.9	10490	1167.4	9.0
JUNE	1206	106.2	11.4	11696	1273.6	9.2
JULY	657	86.4	7.6	12353	1360.0	9.1
AUGUST	825	81.7	10.1	13178	1441.7	9.1
SEPTEMBER	1358	112.5	12.1	14536	1554.2	9.4
OCTOBER	793	89.2	8.9	15329	1643.4	9.3
NOVEMBER	446	51.2	8.7	15775	1694.6	9.3
DECEMBER	438	48.9	9.0	16213	1743.5	9.3
JANUARY	401	50.4	8.0	16614	1793.9	9.3
FEBRUARY	1040	123.0	8.5	17654	1916.9	9.2
MARCH	1070	92.6	11.6	18724	2009.5	9.3

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA '85 CHEV S-10 PICKUP
VEHICLE USA #: CM2388 ENGINE TYPE: V-6 FT. ORD METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
MAY	12	0.0	0.0	12	0.0	0.0
JUNE	1233	58.4	21.1	1245	58.4	21.3
JULY	2120	66.8	31.7	3365	125.2	26.9
AUGUST	668	31.8	21.0	4033	157.0	25.7
CONVERTED TO METHANOL						
DECEMBER	125	49.2	2.5	125	49.2	2.5
JANUARY	1001	76.6	13.1	1126	125.8	9.0
FEBRUARY	232	38.6	6.0	1358	164.4	8.3
MARCH	549	61.5	8.9	1907	225.9	8.4
APRIL	806	82.7	9.7	2713	308.6	8.8
MAY	921	81.6	11.3	3634	390.2	9.3
JUNE	1241	97.1	12.8	4875	487.3	10.0
JULY	1243	110.3	11.3	6118	597.6	10.2
AUGUST	1062	93.0	11.4	7180	690.6	10.4
SEPTEMBER	984	89.1	11.0	8164	779.7	10.5
OCTOBER	1027	73.8	13.9	9191	853.5	10.8
NOVEMBER	849	86.5	9.8	10040	940.0	10.7
DECEMBER	404	44.0	9.2	10444	984.0	10.6
JANUARY	588	49.6	11.9	11032	1033.6	10.7
FEBRUARY	1146	78.2	14.7	12178	1111.8	11.0
MARCH	650	63.2	10.3	12828	1175.0	10.9
APRIL	457	62.0	7.4	13285	1237.0	10.7
MAY	507	56.7	8.9	13792	1293.7	10.7
JUNE	587	79.5	7.4	14379	1373.2	10.5
JULY	697	70.8	9.8	15076	1444.0	10.4
AUGUST	1522	140.4	10.8	16598	1584.4	10.5
SEPTEMBER	1206	115.7	10.4	17804	1700.1	10.5
OCTOBER	1093	115.6	9.5	18897	1815.7	10.4
NOVEMBER	1474	124.3	11.9	20371	1940.0	10.5
DECEMBER	892	88.6	10.1	21263	2028.6	10.5
JANUARY	1294	109.9	11.8	22557	2138.5	10.5
FEBRUARY	837	101.0	8.3	23394	2239.5	10.4
MARCH	964	87.8	11.0	24358	2327.3	10.5

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
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MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA '85 CHEV S-10 PICKUP
VEHICLE USA #: CM2889 ENGINE TYPE: V-6 FT. ORD METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
MAY	28	0.0	0.0	28	0.0	0.0
JUNE	1117	60.6	18.4	1145	60.6	18.9
JULY	1243	71.1	17.5	2388	131.7	18.1
AUGUST	1050	55.0	19.1	3438	186.7	18.4
SEPTEMBER	1356	69.4	19.5	4794	256.1	18.7
OCTOBER	1201	61.0	19.7	5995	317.1	18.9
NOVEMBER	399	11.0	36.3	6394	328.1	19.5
CONVERTED TO METHANOL						
JANUARY	949	118.2	8.0	949	118.2	8.0
FEBRUARY	437	56.6	7.7	1386	174.8	7.9
MARCH	972	98.7	9.8	2358	273.5	8.6
APRIL	644	64.3	10.0	3002	337.8	8.9
JUNE	555	64.3	8.6	3557	402.1	8.8
JULY	483	60.7	8.0	4040	462.8	8.7
AUGUST	479	51.5	9.3	4519	514.3	8.8
SEPTEMBER	519	67.8	7.7	5038	582.1	8.7
OCTOBER	599	67.0	8.9	5637	649.1	8.7
NOVEMBER	530	45.7	11.6	6167	694.8	8.9
DECEMBER	209	27.1	7.7	6376	721.9	8.8
JANUARY	436	63.9	6.8	6812	785.8	8.7
FEBRUARY	482	57.2	8.4	7294	843.0	8.7
MARCH	594	68.7	8.6	7888	911.7	8.7
APRIL	507	60.4	8.4	8395	972.1	8.6
MAY	345	42.8	8.1	8740	1014.9	8.6
JUNE	600	58.2	10.3	9340	1073.1	8.7
JULY	511	67.2	7.6	9851	1140.3	8.6
AUGUST	541	59.8	9.0	10392	1200.1	8.7
SEPTEMBER	416	41.1	10.1	10808	1241.2	8.7
NOVEMBER	156	15.0	10.4	10964	1256.2	8.7

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA '85 CHEV S-10 PICKUP
VEHICLE USA #: CM2891 ENGINE TYPE: V-6 FT. ORD METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
MAY	62	4.2	14.8	62	4.2	14.8
JUNE	1060	54.7	19.4	1122	58.9	19.0
JULY	1026	63.4	16.2	2148	122.3	17.6
AUGUST	1134	59.2	19.2	3282	181.5	18.1
SEPTEMBER	1573	82.3	19.1	4855	263.8	18.4
CONVERTED TO METHANOL						
FEBRUARY	877	77.7	11.3	877	77.7	11.3
MARCH	1123	109.3	10.3	2000	187.0	10.7
APRIL	165	14.0	11.8	2165	201.0	10.8
MAY	393	40.6	9.7	2558	241.6	10.6
JUNE	920	96.7	9.5	3478	338.3	10.3
JULY	989	113.6	8.7	4467	451.9	9.9
AUGUST	1142	117.2	9.7	5609	569.1	9.9
SEPTEMBER	1137	98.0	11.6	6746	667.1	10.1
OCTOBER	1159	98.1	11.8	7905	765.2	10.3
NOVEMBER	942	89.2	10.6	8847	854.4	10.4
DECEMBER	1059	91.9	11.5	9906	946.3	10.5
JANUARY	956	77.5	12.3	10862	1023.8	10.6
FEBRUARY	1313	104.4	12.6	12175	1128.2	10.8
MARCH	994	103.3	9.6	13169	1231.5	10.7
APRIL	780	83.5	9.3	13949	1315.0	10.6
MAY	1302	115.3	11.3	15251	1430.3	10.7
JUNE	1000	89.3	11.2	16251	1519.6	10.7
JULY	971	87.1	11.1	17222	1606.7	10.7
AUGUST	671	94.1	7.1	17893	1700.8	10.5
SEPTEMBER	1291	93.1	13.9	19184	1793.9	10.7
OCTOBER	1362	150.6	9.0	20546	1944.5	10.6
NOVEMBER	938	112.8	8.3	21484	2057.3	10.4
DECEMBER	1022	97.3	10.5	22506	2154.6	10.4
JANUARY	1084	112.4	9.6	23590	2267.0	10.4
FEBRUARY	635	91.0	7.0	24225	2358.0	10.3
MARCH	305	55.0	5.5	24530	2413.0	10.2

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA '95 CHEV S-10 PICKUP
VEHICLE USA #: CM2892 ENGINE TYPE: V-6 FT. ORD METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
MAY	42	0.0	0.0	42	0.0	0.0
JUNE	1274	64.4	19.8	1316	64.4	20.4
JULY	1398	73.8	18.9	2714	138.2	19.6
AUGUST	880	48.1	18.3	3594	186.3	19.3
SEPTEMBER	793	44.5	17.8	4387	230.8	19.0
OCTOBER	1436	67.1	21.4	5823	297.9	19.5
NOVEMBER	733	38.4	19.1	6556	336.3	19.5
CONVERTED TO METHANOL						
JANUARY	911	84.0	10.8	911	84.0	10.8
FEBRUARY	320	46.4	6.9	1231	130.4	9.4
MARCH	237	18.2	13.0	1468	148.6	9.9
OCTOBER	419	67.5	6.2	1887	216.1	8.7
NOVEMBER	769	49.1	15.7	2656	265.2	10.0
DECEMBER	607	63.8	9.5	3263	329.0	9.9
JANUARY	816	93.1	8.8	4079	422.1	9.7
FEBRUARY	885	84.4	10.5	4964	506.5	9.8
MARCH	896	82.1	10.9	5860	588.6	10.0
APRIL	857	98.7	8.7	6717	687.3	9.8
MAY	770	92.9	8.3	7487	780.2	9.6
JUNE	989	99.7	9.9	8476	879.9	9.6
JULY	772	94.0	8.2	9248	973.9	9.5
AUGUST	927	84.1	11.0	10175	1058.0	9.6
SEPTEMBER	751	89.6	8.4	10926	1147.6	9.5
OCTOBER	840	95.8	8.8	11766	1243.4	9.5
NOVEMBER	413	17.5	23.6	12179	1260.9	9.7
DECEMBER	552	64.4	8.6	12731	1325.3	9.6
JANUARY	640	74.0	8.6	13371	1399.3	9.6
FEBRUARY	1133	112.0	10.1	14504	1511.3	9.6
MARCH	771	78.3	9.8	15275	1589.6	9.6

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA '95 CHEV S-10 PICKUP
VEHICLE USA #: CM2893 ENGINE TYPE: V-6 FT. ORD METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
MAY	80	4.9	16.3	80	4.9	16.3
JUNE	1023	58.2	17.6	1103	63.1	17.5
JULY	1358	71.4	19.0	2461	134.5	18.3
AUGUST	596	30.0	19.9	3057	164.5	18.6
SEPTEMBER	329	9.7	33.9	3386	174.2	19.4
CONVERTED TO METHANOL						
DECEMBER	231	57.9	4.0	231	57.9	4.0
JANUARY	826	75.8	10.9	1057	133.7	7.9
FEBRUARY	236	26.0	9.1	1293	159.7	8.1
MARCH	614	73.4	8.4	1907	233.1	8.2
APRIL	607	67.0	9.1	2514	300.1	8.4
MAY	551	63.4	8.7	3065	363.5	8.4
JUNE	581	68.0	8.5	3646	431.5	8.4
JULY	507	58.7	8.6	4153	490.2	8.5
AUGUST	365	42.8	8.5	4518	533.0	8.5
SEPTEMBER	653	66.7	9.8	5171	599.7	8.6
OCTOBER	743	70.3	10.6	5914	670.0	8.8
NOVEMBER	931	84.0	11.1	6845	754.0	9.1
DECEMBER	723	65.9	11.0	7568	819.9	9.2
JANUARY	530	57.7	9.2	8098	877.6	9.2
FEBRUARY	525	62.5	8.4	8623	940.1	9.2
MARCH	348	37.3	9.3	8971	977.4	9.2
APRIL	599	72.0	8.3	9570	1049.4	9.1
MAY	533	53.7	9.9	10103	1103.1	9.2
JUNE	500	54.0	9.3	10603	1157.1	9.2
JULY	602	59.6	10.1	11205	1216.7	9.2
AUGUST	626	87.9	7.1	11831	1304.6	9.1
SEPTEMBER	160	16.3	9.8	11991	1320.9	9.1
NOVEMBER	55	4.1	13.4	12046	1325.0	9.1
DECEMBER	436	52.5	8.3	12482	1377.5	9.1
JANUARY	412	42.4	9.7	12894	1419.9	9.1
FEBRUARY	449	29.0	15.5	13343	1448.9	9.2
MARCH	364	43.7	8.3	13707	1492.6	9.2

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA '85 CHEV S-10 PICKUP
VEHICLE USA #: CM2894 ENGINE TYPE: L-4 FT. ORD METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
MAY	282	19.5	14.5	282	19.5	14.5
JUNE	1081	38.6	28.0	1363	58.1	23.5
JULY	878	35.4	24.8	2241	93.5	24.0
AUGUST	866	43.9	19.7	3107	137.4	22.6
SEPTEMBER	1168	50.1	23.3	4275	187.5	22.8
OCTOBER	1342	72.6	18.5	5617	260.1	21.6
NOVEMBER	1047	54.1	19.4	6664	314.2	21.2
DECEMBER	857	43.1	19.9	7521	357.3	21.0
JANUARY	1273	50.3	25.3	8794	407.6	21.6
FEBRUARY	542	29.0	18.7	9336	436.6	21.4
CONVERTED TO METHANOL						
MARCH	93	10.0	9.3	93	10.0	9.3
OCTOBER	128	6.5	19.7	221	16.5	13.4
NOVEMBER	748	63.5	11.8	969	80.0	12.1
DECEMBER	988	95.5	10.3	1957	175.5	11.2
JANUARY	440	9.2	47.8	2397	184.7	13.0
FEBRUARY	515	38.3	13.4	2912	223.0	13.1
MARCH	662	62.1	10.7	3574	285.1	12.5
APRIL	602	55.3	10.9	4176	340.4	12.3
MAY	387	42.8	9.0	4563	383.2	11.9
JUNE	828	77.7	10.7	5391	460.9	11.7
JULY	473	36.0	13.1	5864	496.9	11.8
AUGUST	639	60.2	10.6	6503	557.1	11.7
SEPTEMBER	120	21.0	5.7	6623	578.1	11.5
DECEMBER	523	0.0	0.0	7146	578.1	12.4
JANUARY	403	60.5	6.7	7549	638.6	11.8
FEBRUARY	297	34.2	8.7	7846	672.8	11.7
MARCH	346	22.3	15.5	8192	695.1	11.8

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA '95 CHEV S-10 PICKUP
VEHICLE USA #: CM2895 ENGINE TYPE: V-6 FT. ORD METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
MAY	106	13.0	8.2	106	13.0	8.2
JUNE	567	39.0	14.5	673	52.0	12.9
JULY	595	38.4	15.5	1268	82.4	15.4
AUGUST	393	29.5	13.3	1661	111.9	14.8
SEPTEMBER	1159	66.9	17.3	2820	178.8	15.8
OCTOBER	712	44.9	15.9	3532	223.7	15.8
NOVEMBER	598	27.8	21.5	4130	251.5	16.4
DECEMBER	844	53.0	15.9	4974	304.5	16.3
JANUARY	761	38.5	19.8	5735	343.0	16.7
FEBRUARY	496	31.9	15.5	6231	374.9	16.6
MARCH	121	9.0	13.4	6352	383.9	16.5
CONVERTED TO METHANOL						Mid-Month
MARCH	75	25.0	3.0	75	25.0	3.0
APRIL	338	18.1	18.7	413	43.1	9.6
MAY	597	77.7	7.7	1010	120.8	8.4
JUNE	1006	83.2	12.1	2016	204.0	9.9
JULY	850	85.5	9.9	2866	289.5	9.9
AUGUST	1129	91.5	12.3	3995	381.0	10.5
SEPTEMBER	1118	102.5	10.9	5113	483.5	10.6
OCTOBER	842	81.7	10.3	5955	565.2	10.5
NOVEMBER	834	100.2	8.3	6789	665.4	10.2
DECEMBER	859	89.7	9.6	7648	755.1	10.1
JANUARY	776	52.2	14.9	8424	807.3	10.4
FEBRUARY	1058	98.3	12.0	9482	895.6	10.6
MARCH	1545	118.0	13.1	11027	1013.6	10.9
APRIL	1195	123.8	9.7	12222	1137.4	10.7
MAY	1288	138.0	9.3	13510	1275.4	10.6
JUNE	1621	153.7	10.5	15131	1429.1	10.6
JULY	973	92.8	10.5	16104	1521.9	10.6
AUGUST	303	30.8	9.8	16407	1552.7	10.6
SEPTEMBER	401	48.6	8.3	16808	1601.3	10.5
OCTOBER	597	58.0	10.3	17405	1659.3	10.5
NOVEMBER	222	20.7	10.7	17627	1680.0	10.5

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA '85 CHEV S-10 PICKUP
VEHICLE USA #: CM2896 ENGINE TYPE: L-4 FT. ORD METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
MAY	77	5.4	14.3	77	5.4	14.3
JUNE	1159	44.4	26.1	1236	49.8	24.8
JULY	1170	24.4	48.0	2406	74.2	32.4
AUGUST	473	31.8	14.9	2879	106.0	27.2
SEPTEMBER	1454	64.1	22.7	4333	170.1	25.5
OCTOBER	1452	66.9	21.7	5785	237.0	24.4
NOVEMBER	1032	47.4	21.8	6817	284.4	24.0
DECEMBER	902	47.8	18.9	7719	332.2	23.2
JANUARY	702	43.0	16.3	8421	375.2	22.4
FEBRUARY	182	9.0	20.2	8603	384.2	22.4
CONVERTED TO METHANOL						
MARCH	670	87.8	7.6	670	87.8	7.6
APRIL	528	63.3	8.3	1198	151.1	7.9
MAY	392	40.5	9.7	1590	191.6	8.3
JUNE	248	38.8	6.4	1838	230.4	8.0
JULY	341	44.0	7.8	2179	274.4	7.9
AUGUST	595	60.9	9.8	2774	335.3	8.3
SEPTEMBER	595	73.4	8.1	3369	408.7	8.2
OCTOBER	435	42.1	10.3	3804	450.8	8.4
NOVEMBER	210	26.8	7.8	4014	477.6	8.4
DECEMBER	219	25.6	8.6	4233	503.2	8.4
JANUARY	143	6.1	23.4	4376	505.3	8.6
FEBRUARY	343	41.0	8.4	4719	550.3	8.6
MARCH	296	52.4	5.6	5015	602.7	8.3
APRIL	257	37.0	6.9	5272	639.7	8.2
MAY	343	27.0	12.7	5615	666.7	8.4
JUNE	327	57.9	5.6	5942	724.6	8.2
JULY	205	27.6	7.4	6147	752.2	8.2
AUGUST	621	55.0	11.3	6768	807.2	8.4
SEPTEMBER	363	44.0	8.3	7131	851.2	8.4
OCTOBER	367	43.1	8.5	7498	894.3	8.4
NOVEMBER	203	0.0	0.0	7701	894.3	8.6
DECEMBER	527	66.3	7.9	8228	960.6	8.6
JANUARY	199	19.8	10.1	8427	980.4	8.6
FEBRUARY	303	53.7	5.6	8730	1034.1	8.4
MARCH	123	19.1	6.4	8853	1053.2	8.4

OPERATIONAL DATA FROM
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VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA '85 CHEV S-10 PICKUP
VEHICLE USA #: CM2897 ENGINE TYPE: V-6 FT. ORD METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
MAY	112	8.8	12.7	112	8.8	12.7
JUNE	789	42.2	18.7	901	51.0	17.7
JULY	848	81.4	10.4	1749	132.4	13.2
AUGUST	549	36.3	15.0	2298	168.7	13.6
SEPTEMBER	516	35.0	14.7	2814	203.9	13.8
OCTOBER	680	59.6	11.4	3494	263.5	13.3
NOVEMBER	481	32.5	14.8	3975	296.0	13.4
DECEMBER	585	35.1	16.7	4560	331.1	13.8
JANUARY	1200	58.4	20.5	5760	389.5	14.8
FEBRUARY	1328	66.6	19.9	7088	456.1	15.5
MARCH	452	27.0	16.7	7540	483.1	15.6
CONVERTED TO METHANOL						Mid-Month
MARCH	43	10.0	4.3	43	10.0	4.3
APRIL	352	43.0	8.2	395	53.0	7.5
MAY	655	61.8	10.6	1050	114.8	9.1
JUNE	959	94.1	10.2	2009	208.9	9.6
JULY	1336	116.8	11.4	3345	325.7	10.3
AUGUST	904	90.7	10.0	4249	416.4	10.2
SEPTEMBER	1194	123.9	9.6	5443	540.3	10.1
OCTOBER	1025	101.3	10.1	6468	641.6	10.1
NOVEMBER	1108	103.0	10.8	7576	744.6	10.2
DECEMBER	341	38.0	9.0	7917	782.6	10.1
JANUARY	756	62.9	12.0	8673	845.5	10.3
FEBRUARY	592	44.0	13.5	9265	889.5	10.4
MARCH	1243	121.5	10.2	10508	1011.0	10.4
APRIL	1133	104.1	10.9	11641	1115.1	10.4
MAY	588	60.4	9.7	12229	1175.5	10.4
JUNE	1421	120.7	11.8	13650	1296.2	10.5
JULY	863	100.5	8.6	14513	1396.7	10.4
AUGUST	622	84.0	7.4	15135	1480.7	10.2
SEPTEMBER	637	60.0	10.6	15772	1540.7	10.2
OCTOBER	613	88.7	6.9	16385	1629.4	10.1
NOVEMBER	491	74.7	6.6	16876	1704.1	9.9
DECEMBER	294	17.5	16.8	17170	1721.6	10.0
JANUARY	464	75.7	6.1	17634	1797.3	9.8
FEBRUARY	676	81.9	8.3	18310	1879.2	9.7
MARCH	369	60.2	6.1	18679	1939.4	9.6

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MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA '95 CHEV S-10 PICKUP
VEHICLE USA #: CM2898 ENGINE TYPE: V-6 FT. ORD METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
MAY	870	47.3	18.2	870	47.3	18.2
JUNE	2982	109.2	27.3	3852	157.0	24.5
JULY	617	41.4	14.9	4469	198.4	22.5
AUGUST	957	53.4	17.9	5426	251.8	21.5
SEPTEMBER	152	8.0	19.0	5578	259.8	21.5
CONVERTED TO METHANOL						
DECEMBER	416	41.2	10.1	416	41.2	10.1
JANUARY	521	53.3	9.8	937	94.5	9.9
FEBRUARY	294	41.7	7.1	1231	136.2	9.0
MARCH	695	63.2	11.0	1926	199.4	9.7
APRIL	886	105.7	8.4	2812	305.1	9.2
MAY	667	75.7	8.8	3479	380.8	9.1
JUNE	738	76.4	9.7	4217	457.2	9.2
JULY	895	92.7	9.7	5112	549.9	9.3
AUGUST	448	57.5	7.8	5560	607.4	9.2
SEPTEMBER	555	63.3	8.8	6115	670.7	9.1
OCTOBER	795	73.6	9.4	6910	744.3	9.1
NOVEMBER	479	51.4	9.3	7289	795.7	9.2
DECEMBER	494	63.6	7.8	7783	859.3	9.1
JANUARY	544	77.6	7.0	8327	936.9	8.9
FEBRUARY	354	38.7	9.1	8681	975.6	8.9
MARCH	469	68.5	6.8	9150	1044.1	8.8
APRIL	455	54.4	8.4	9605	1098.5	8.7
MAY	523	55.9	9.4	10128	1154.4	8.8
JUNE	656	67.1	9.8	10784	1221.5	8.8
JULY	561	60.4	9.3	11345	1281.9	8.9
AUGUST	466	58.5	8.0	11811	1340.4	8.8
SEPTEMBER	464	52.0	8.9	12275	1392.4	8.8
OCTOBER	445	52.9	8.4	12720	1445.3	8.8
NOVEMBER	321	32.9	9.8	13041	1478.2	8.8
DECEMBER	446	49.5	9.0	13487	1527.7	8.8
JANUARY	309	35.7	8.7	13796	1563.4	8.8
FEBRUARY	303	44.0	6.9	14099	1607.4	8.8
MARCH	272	42.8	6.4	14371	1650.2	8.7

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MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA '85 CHEV S-10 PICKUP
VEHICLE USA #: CM2899 ENGINE TYPE: L-4 FT. ORD METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
MAY	614	28.1	21.9	614	28.1	21.9
JUNE	3332	140.6	23.7	3946	168.7	23.4
JULY	1134	49.7	22.8	5080	218.4	23.3
AUGUST	271	16.6	16.3	5351	235.0	22.8
SEPTEMBER	62	5.0	12.4	5413	240.0	22.6
TRANSFERRED TO JPL						Mid-Month
CONVERTED TO METHANOL						
SEPTEMBER	452	58.2	7.8	452	58.2	7.8
OCTOBER	442	30.6	14.4	894	88.8	10.1
NOVEMBER	661	77.0	8.6	1555	165.8	9.4
DECEMBER	556	38.8	14.3	2111	204.6	10.3
JANUARY	513	98.6	5.2	2624	303.2	8.7
FEBRUARY	442	28.8	15.3	3066	332.0	9.2
MARCH	471	48.2	9.8	3537	380.2	9.3
APRIL	425	66.8	6.4	3962	447.0	8.9
MAY	466	63.9	7.3	4428	510.9	8.7
JUNE	645	67.3	9.6	5073	578.2	8.8
JULY	680	68.4	9.9	5753	646.6	8.9
AUGUST	591	42.5	13.9	6344	689.1	9.2
SEPTEMBER	863	78.7	11.0	7207	767.8	9.4
OCTOBER	990	89.6	11.0	8197	857.4	9.6
NOVEMBER	864	58.6	14.7	9061	916.0	9.9
DECEMBER	566	35.8	10.1	9627	971.8	9.9
JANUARY	585	35.5	16.5	10212	1007.3	10.1
FEBRUARY	1232	83.4	14.8	11444	1090.7	10.5
MARCH	469	40.4	11.6	11913	1131.1	10.5
TRANSFERRED TO SIDP @						
MAY	38	18.1	2.1	11951	1149.2	10.4
JUNE	78	0.0	0.0	12029	1149.2	10.5
JULY	72	0.0	0.0	12101	1149.2	10.5

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MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA '85 CHEV S-10 PICKUP
VEHICLE USA #: CM2900 ENGINE TYPE: V-6 FT. ORD METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
MAY	604	32.4	18.6	604	32.4	18.6
JUNE	1075	48.6	22.1	1679	81.0	20.7
AUGUST	862	42.5	20.3	2541	123.5	20.6
SEPTEMBER	755	43.8	17.2	3296	167.3	19.7
OCTOBER	1085	50.5	21.5	4381	217.8	20.1
NOVEMBER	441	17.0	25.9	4822	234.8	20.5
DECEMBER	1470	70.2	20.9	6292	305.0	20.6
JANUARY	892	10.5	85.0	7184	315.5	22.8
CONVERTED TO METHANOL						
FEBRUARY	139	30.1	4.6	139	30.1	4.6
MARCH	554	72.9	7.6	693	103.0	6.7
APRIL	555	68.0	8.2	1248	171.0	7.3
MAY	413	49.7	8.3	1661	220.7	7.5
JUNE	566	70.2	8.1	2227	290.9	7.7
JULY	424	39.9	10.6	2651	330.8	8.0
AUGUST	540	83.0	6.5	3191	413.8	7.7
SEPTEMBER	270	25.3	10.7	3461	439.1	7.9
OCTOBER	308	47.0	6.6	3769	486.1	7.8
NOVEMBER	372	42.8	8.7	4141	528.9	7.8
DECEMBER	353	45.4	7.8	4494	574.3	7.8
JANUARY	463	50.0	9.3	4957	624.3	7.9
FEBRUARY	482	90.8	5.3	5439	715.1	7.6
MARCH	567	86.0	6.6	6006	801.1	7.5
APRIL	408	55.1	7.4	6414	856.2	7.5
MAY	378	41.5	9.1	6792	897.7	7.6
JUNE	479	52.0	9.2	7271	949.7	7.7
JULY	323	39.4	8.2	7594	989.1	7.7
AUGUST	209	23.7	8.8	7803	1012.8	7.7
SEPTEMBER	418	45.7	9.1	8221	1058.5	7.8
OCTOBER	322	41.8	7.7	8543	1100.3	7.8
NOVEMBER	296	23.7	12.5	8839	1124.0	7.9
DECEMBER	284	61.9	4.6	9123	1185.9	7.7
JANUARY	230	0.0	0.0	9353	1185.9	7.9

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
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MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA '85 CHE ' S-10 PICKUP
VEHICLE USA #: CM2901 ENGINE ' YPE: V-6 FT. ORD METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
MAY	968	37.6	25.7	968	37.6	25.7
JUNE	1966	89.5	22.0	2934	127.1	23.1
JULY	1680	74.8	22.5	4614	201.9	22.9
AUGUST	495	35.9	13.8	5109	237.8	21.5
SEPTEMBER	82	0.0	0.0	5191	237.8	21.8
CONVERTED TO METHANOL						
DECEMBER	379	62.9	6.0	379	62.9	6.0
JANUARY	146	23.0	6.3	525	85.9	6.1
MARCH	1250	144.1	8.7	1775	230.0	7.7
APRIL	1133	141.1	8.0	2908	371.1	7.8
MAY	1028	114.2	9.0	3936	485.3	8.1
JUNE	1446	117.6	12.3	5382	602.9	8.9
JULY	1011	97.2	10.4	6393	700.1	9.1
AUGUST	532	46.3	11.5	6925	746.4	9.3
SEPTEMBER	731	78.4	9.3	7656	824.8	9.3
OCTOBER	898	102.1	8.8	8554	926.9	9.2
NOVEMBER	693	68.7	10.1	9247	995.6	9.3
DECEMBER	399	29.0	13.8	9646	1024.6	9.4
JANUARY	963	59.1	16.3	10609	1083.7	9.8
FEBRUARY	720	71.9	10.0	11329	1155.6	9.8
MARCH	490	49.2	10.0	11819	1204.8	9.8
APRIL	753	79.2	9.5	12572	1284.0	9.8
MAY	750	62.2	12.1	13322	1346.2	9.9
JUNE	1023	97.0	10.5	14345	1443.2	9.9
JULY	815	78.5	10.4	15160	1521.7	10.0
AUGUST	448	66.2	6.8	15608	1587.9	9.8
SEPTEMBER	579	76.8	7.5	16187	1664.7	9.7
OCTOBER	488	68.6	7.1	16675	1733.3	9.6
NOVEMBER	459	58.2	7.9	17134	1791.5	9.6
DECEMBER	449	76.8	5.8	17583	1868.3	9.4
JANUARY	452	61.4	7.4	18035	1929.7	9.3
FEBRUARY	259	37.4	6.9	18294	1967.1	9.3
MARCH	410	45.4	9.0	18704	2012.5	9.3

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
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MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA '85 CHEV S-10 PICKUP
VEHICLE USA #: CM2902 ENGINE TYPE: V-6 FT. ORD METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
MAY	657	28.3	23.2	657	28.3	23.2
JUNE	953	35.9	26.5	1610	64.2	25.1
JULY	206	11.5	17.9	1816	75.7	24.0
AUGUST	1170	53.2	22.0	2986	128.9	23.2
SEPTEMBER	1521	65.2	23.3	4507	194.1	23.2
OCTOBER	1727	78.4	22.0	6234	272.5	22.9
NOVEMBER	1389	57.4	24.2	7623	329.9	23.1
CONVERTED TO METHANOL						
JANUARY	1356	123.6	11.0	1356	123.6	11.0
FEBRUARY	401	55.6	7.2	1757	179.2	9.8
MARCH	495	56.2	8.8	2252	235.4	9.6
APRIL	606	81.5	7.4	2858	316.9	9.0
MAY	215	30.4	7.1	3073	347.3	8.8
JUNE	556	22.7	24.5	3629	370.0	9.8
JULY	977	93.1	10.0	4606	468.1	9.8
AUGUST	537	54.9	9.8	5143	523.0	9.8
SEPTEMBER	539	56.5	9.5	5682	579.5	9.8
OCTOBER	399	33.6	11.9	6081	613.1	9.9
NOVEMBER	360	36.1	10.0	6441	649.2	9.9
DECEMBER	318	50.0	6.4	6759	699.2	9.7
JANUARY	304	20.0	15.2	7063	719.2	9.8
FEBRUARY	383	51.7	7.4	7446	770.9	9.7
MARCH	383	56.8	6.7	7829	827.7	9.5
APRIL	601	71.6	8.4	8430	899.3	9.4
MAY	496	57.0	8.7	8926	956.3	9.3
JUNE	524	56.4	9.3	9450	1012.7	9.3
JULY	502	44.0	11.4	9952	1056.7	9.4
AUGUST	302	56.9	5.3	10254	1113.6	9.2
SEPTEMBER	645	53.7	12.0	10899	1167.3	9.3
OCTOBER	606	76.8	7.9	11505	1244.1	9.2
NOVEMBER	291	48.9	6.0	11796	1293.0	9.1
DECEMBER	235	22.0	10.7	12031	1315.0	9.1
JANUARY	488	55.8	8.7	12519	1370.8	9.1
FEBRUARY	368	32.5	11.3	12887	1403.3	9.2
MARCH	195	31.6	6.2	13082	1434.9	9.1

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA '93 FORD ESCORT, 4 DOOR SEDAN
VEHICLE USA #: CN0436 ENGINE TYPE: I-4 FT. ORD METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
AUGUST	381	37.1	10.3	381	37.1	10.3
SEPTEMBER	191	26.3	7.3	572	63.4	9.0
OCTOBER	292	35.8	8.2	864	99.2	8.7
NOVEMBER	429	43.0	10.0	1293	142.2	9.1
DECEMBER	37	0.0	0.0	1330	142.2	9.4
FEBRUARY	130	9.1	14.3	1460	151.3	9.6
MARCH	67	9.5	7.1	1527	160.8	9.5
JULY	11	0.0	0.0	1538	160.8	9.6
MARCH	278	24.0	11.6	1816	184.8	9.8
APRIL	734	63.5	11.6	2550	248.3	10.3
MAY	144	7.2	20.0	2694	255.5	10.5
JUNE	779	75.7	10.3	3473	331.2	10.5
JULY	506	50.4	10.0	3979	381.6	10.4
AUGUST	422	33.8	12.5	4401	415.4	10.6
SEPTEMBER	551	51.9	10.6	4952	467.3	10.6
OCTOBER	343	32.2	10.7	5295	499.5	10.6
NOVEMBER	795	68.5	11.6	6090	568.0	10.7
DECEMBER	543	38.5	14.1	6633	606.5	10.9
JANUARY	635	52.8	12.0	7268	659.3	11.0
FEBRUARY	743	66.1	11.2	8011	725.4	11.0
MARCH	821	64.5	12.7	8832	789.9	11.2
MAY	1	5.7	.2	8833	795.6	11.1
TRANSFERRED TO SIDP @						Mid-Month
MAY	128	19.1	6.7	8961	814.7	11.0
JUNE	218	16.0	13.6	9179	830.7	11.0
JULY	140	9.6	14.6	9319	840.3	11.1

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

HOST ACTIVITY: FOCA '93 FORD ESCORT, 4 DOOR SEDAN
VEHICLE USA #: CN0437 ENGINE TYPE: I-4 FT. ORD METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
JULY	2	0.0	0.0	2	0.0	0.0
AUGUST	325	28.2	11.5	327	28.2	11.6
SEPTEMBER	355	33.2	10.7	682	61.4	11.1
OCTOBER	643	53.7	12.0	1325	115.1	11.5
NOVEMBER	422	42.4	10.0	1747	157.5	11.1
DECEMBER	192	19.3	9.9	1939	176.8	11.0
JANUARY	293	28.4	10.3	2232	205.2	10.9
FEBRUARY	249	18.4	13.5	2481	223.6	11.1
MARCH	797	61.4	13.0	3278	285.0	11.5
APRIL	487	48.2	10.1	3765	333.2	11.3
MAY	374	24.7	15.1	4139	357.9	11.6
JUNE	377	47.0	8.0	4516	404.9	11.2
JULY	499	35.6	14.0	5015	440.5	11.4
AUGUST	535	40.8	13.1	5550	481.3	11.5
SEPTEMBER	441	52.0	8.5	5991	533.3	11.2
OCTOBER	597	62.8	9.5	6588	596.1	11.1
NOVEMBER	314	29.6	10.6	6902	625.7	11.0
DECEMBER	998	70.3	14.2	7900	696.0	11.4
JANUARY	890	61.3	14.5	8790	757.3	11.6
FEBRUARY	1266	102.6	12.3	10056	859.9	11.7
MARCH	708	59.5	11.9	10764	919.4	11.7
TRANSFERRED TO SIDP @						
MAY	78	8.6	9.1	10842	928.0	11.7
JUNE	145	8.6	16.9	10987	936.6	11.7
JULY	216	25.4	8.5	11203	962.0	11.6

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA '83 FORD ESCORT, 4 DOOR SEDAN
VEHICLE USA #: CN0438 ENGINE TYPE: I-4 FT. ORD METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
AUGUST	320	25.2	12.7	320	25.2	12.7
SEPTEMBER	662	50.6	13.1	982	75.8	13.0
OCTOBER	500	43.4	11.5	1482	119.2	12.4
NOVEMBER	439	40.5	10.8	1921	159.7	12.0
DECEMBER	683	57.6	11.9	2604	217.3	12.0
JANUARY	499	54.2	9.2	3103	271.5	11.4
FEBRUARY	662	53.9	12.3	3765	325.4	11.6
MARCH	248	26.9	9.2	4013	352.3	11.4
APRIL	503	41.7	12.1	4516	394.0	11.5
MAY	337	28.9	11.7	4853	422.9	11.5
JUNE	307	33.1	9.3	5160	456.0	11.3
JULY	372	32.7	11.4	5532	488.7	11.3
AUGUST	620	54.5	11.4	6152	543.2	11.3
SEPTEMBER	675	45.0	15.0	6827	588.2	11.6
OCTOBER	682	60.0	11.4	7509	648.2	11.6
NOVEMBER	474	43.6	10.9	7983	691.8	11.5
DECEMBER	632	47.6	13.3	8615	739.4	11.7
JANUARY	498	48.2	10.3	9113	787.6	11.6
FEBRUARY	587	47.3	12.4	9700	834.9	11.6
MARCH	413	41.3	10.0	10113	876.2	11.5
MAY	71	9.5	7.5	10184	885.7	11.5
JUNE	296	21.3	13.9	10480	907.0	11.6
JULY	303	23.5	12.9	10783	930.5	11.6

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA '93 FORD ESCORT, 4 DOOR SEDAN
VEHICLE USA #: CN0439 ENGINE TYPE: I-4 FT. ORD METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
AUGUST	789	64.6	12.2	789	64.6	12.2
SEPTEMBER	400	36.3	11.0	1189	100.9	11.8
OCTOBER	410	39.6	10.4	1599	140.5	11.4
NOVEMBER	321	30.7	10.5	1920	171.2	11.2
DECEMBER	272	26.8	10.1	2192	198.0	11.1
JANUARY	225	20.1	11.2	2417	218.1	11.1
FEBRUARY	311	18.7	16.6	2728	236.8	11.5
MARCH	494	51.2	9.6	3222	288.0	11.2
APRIL	556	44.5	12.5	3778	332.5	11.4
MAY	316	27.2	11.6	4094	359.7	11.4
JUNE	376	40.6	9.3	4470	400.3	11.2
JULY	430	44.1	9.8	4900	444.4	11.0
AUGUST	404	41.7	9.7	5304	486.1	10.9
SEPTEMBER	205	20.1	10.2	5509	506.2	10.9
OCTOBER	336	35.5	9.5	5845	541.7	10.8
NOVEMBER	315	24.6	12.8	6160	566.3	10.9
DECEMBER	217	27.3	7.9	6377	593.6	10.7
JANUARY	269	28.9	9.3	6646	622.5	10.7
FEBRUARY	253	25.2	10.0	6899	647.7	10.7
MARCH	177	12.8	13.8	7076	660.5	10.7
TRANSFERRED TO SIDP @						
MAY	59	9.0	6.6	7135	669.5	10.7
JUNE	246	19.0	12.9	7381	688.5	10.7
JULY	184	10.0	18.4	7565	698.5	10.8

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA '83 FORD ESCORT, 4 DOOR SEDAN
VEHICLE USA #: CN0440 ENGINE TYPE: I-4 FT. ORD METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
JULY	47	6.2	7.6	47	6.2	7.6
AUGUST	929	70.4	13.2	976	76.6	12.7
SEPTEMBER	413	37.9	10.9	1389	114.5	12.1
OCTOBER	563	57.1	9.9	1952	171.6	11.4
NOVEMBER	127	9.0	14.1	2079	180.6	11.5
DECEMBER	281	25.0	11.2	2360	205.6	11.5
JANUARY	435	40.1	10.8	2795	245.7	11.4
FEBRUARY	438	39.0	11.2	3233	284.7	11.4
MARCH	488	32.2	15.2	3721	316.9	11.7
APRIL	624	59.1	10.6	4345	376.0	11.6
MAY	504	50.3	10.0	4849	426.3	11.4
JUNE	547	47.4	11.5	5396	473.7	11.4
JULY	504	52.6	9.6	5900	526.3	11.2
AUGUST	553	45.3	12.2	6453	571.6	11.3
SEPTEMBER	615	51.9	11.8	7068	623.5	11.3
OCTOBER	549	65.7	8.4	7617	689.2	11.1
NOVEMBER	567	71.4	7.9	8184	760.6	10.8
DECEMBER	484	50.0	9.7	8668	810.6	10.7
JANUARY	658	67.3	9.8	9326	877.9	10.6
FEBRUARY	509	42.2	12.1	9835	920.1	10.7
MARCH	378	36.9	10.2	10213	957.0	10.7
TRANSFERRED TO SIDP @						
MAY	47	0.0	0.0	10260	957.0	10.7
JUNE	255	17.0	15.0	10515	974.0	10.8
JULY	32	10.0	3.2	10547	984.0	10.7

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: FOCA '83 CHEV CITATION, 4 DOOR SEDAN
VEHICLE USA #: CN0491 ENGINE TYPE: V-6 FT. ORD METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
NOVEMBER	224	18.4	12.2	224	18.4	12.2
DECEMBER	109	12.5	8.7	333	30.9	10.8
JANUARY	294	24.2	12.1	627	55.1	11.4
FEBRUARY	361	34.2	10.6	988	89.3	11.1
MARCH	341	50.8	6.7	1329	140.1	9.5
APRIL	352	33.5	10.5	1681	173.6	9.7
MAY	353	46.2	7.6	2034	219.8	9.3
JUNE	362	46.8	7.7	2396	266.6	9.0
JULY	263	16.3	16.1	2659	282.9	9.4
AUGUST	323	35.0	9.2	2982	317.9	9.4
SEPTEMBER	344	25.0	13.8	3326	342.9	9.7
OCTOBER	475	50.4	9.4	3801	393.3	9.7
NOVEMBER	429	41.3	10.4	4230	434.6	9.7
DECEMBER	415	53.8	7.7	4645	488.4	9.5
JANUARY	613	36.7	16.7	5258	525.1	10.0
FEBRUARY	744	42.4	17.5	6002	567.5	10.6
MARCH	297	36.6	8.1	6299	604.1	10.4
TRANSFERRED TO SIDP 0						
MAY	14	0.0	0.0	6313	604.1	10.5
JUNE	152	16.5	9.2	6465	620.6	10.4
JULY	40	8.1	4.9	6505	628.7	10.3

Monthly Cumulative Fuel Reports for Each Vehicle at Sierra Army Depot

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP FORD ESCORT
VEHICLE USA #: CN0445 ENGINE TYPE: I-4 S.A.D.P. METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
NOVEMBER	32	0.0	0.0	32	0.0	0.0
DECEMBER	217	26.4	8.2	249	26.4	9.4
JANUARY	81	9.0	9.0	330	35.4	9.3
APRIL	161	9.0	17.9	491	44.4	11.1
MAY	1003	84.9	11.8	1494	129.3	11.6
JUNE	1984	127.2	15.6	3478	256.5	13.6
JULY	277	14.1	19.6	3755	270.6	13.9
AUGUST	353	25.7	13.7	4108	296.3	13.9
SEPTEMBER	298	25.5	11.7	4406	321.8	13.7
OCTOBER	166	10.0	16.6	4572	331.8	13.8
NOVEMBER	297	26.6	11.2	4869	358.4	13.6
DECEMBER	144	15.0	9.6	5013	373.4	13.4
JANUARY	170	27.9	6.1	5183	401.3	12.9
FEBRUARY	278	23.5	11.8	5461	424.8	12.9
MARCH	236	18.5	12.8	5697	443.3	12.9
APRIL	316	17.7	17.9	6013	461.0	13.0
MAY	219	7.9	27.7	6232	468.9	13.3
JUNE	228	18.3	12.5	6460	487.2	13.3
JULY	287	19.5	15.5	6747	505.7	13.3

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP
VEHICLE USA #: CN0539

FORD ESCORT
ENGINE TYPE: I-4

S.A.D.P. METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
DECEMBER	103	15.0	6.9	103	15.0	6.9
JANUARY	116	8.0	14.5	219	23.0	9.5
FEBRUARY	190	23.1	8.2	409	46.1	8.9
MARCH	1493	82.0	18.2	1902	128.1	14.8
APRIL	2262	130.5	17.3	4164	258.6	16.1
MAY	768	41.3	18.6	4932	299.9	16.4
JUNE	437	38.1	11.5	5369	338.0	15.9
JULY	350	14.0	25.0	5719	352.0	16.2
AUGUST	145	9.0	16.1	5864	361.0	16.2
SEPTEMBER	356	28.8	12.4	6220	389.8	16.0
OCTOBER	376	32.5	11.6	6596	422.3	15.6
NOVEMBER	155	15.6	9.9	6751	437.9	15.4
DECEMBER	309	26.4	11.7	7060	464.3	15.2
JANUARY	833	74.5	11.2	7893	538.8	14.6
FEBRUARY	43	7.0	6.1	7936	545.8	14.5
MARCH	88	6.0	14.7	8024	551.8	14.5
APRIL	405	21.4	18.9	8429	573.2	14.7
MAY	613	39.0	15.7	9042	612.2	14.8
JUNE	293	28.7	10.2	9335	640.9	14.6
JULY	118	15.5	7.6	9453	656.4	14.4

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP FORD ESCORT
VEHICLE USA #: CN0540 ENGINE TYPE: I-4 S.A.D.P. METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
NOVEMBER	35	0.0	0.0	35	0.0	0.0
DECEMBER	330	34.1	9.7	365	34.1	10.7
JANUARY	302	16.4	18.4	667	50.5	13.2
FEBRUARY	293	24.9	11.8	960	75.4	12.7
MARCH	352	33.5	10.5	1312	108.9	12.0
APRIL	371	23.6	15.7	1683	132.5	12.7
MAY	434	30.4	14.3	2117	162.9	13.0
JUNE	361	25.0	14.4	2478	187.9	13.2
JULY	2219	141.9	15.6	4697	329.8	14.2
AUGUST	60	7.5	8.0	4757	337.3	14.1
OCTOBER	447	29.8	15.0	5204	367.1	14.2
NOVEMBER	138	15.1	9.1	5342	382.2	14.0
DECEMBER	306	19.5	15.7	5648	401.7	14.1
JANUARY	242	29.0	8.3	5890	430.7	13.7
FEBRUARY	280	27.7	10.1	6170	458.4	13.5
MARCH	220	18.9	11.6	6390	477.3	13.4
APRIL	367	43.8	8.4	6757	521.1	13.0
MAY	631	43.7	14.4	7388	564.8	13.1
JUNE	493	37.9	13.0	7881	602.7	13.1
JULY	727	59.1	12.3	8608	661.8	13.0

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP FORD ESCORT
VEHICLE USA #: CN0541 ENGINE TYPE: I-4 S.A.D.P. METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
NOVEMBER	125	8.0	15.6	125	8.0	15.6
DECEMBER	662	57.0	11.6	787	65.0	12.1
JANUARY	664	49.5	13.4	1451	114.5	12.7
FEBRUARY	422	33.5	12.6	1873	148.0	12.7
MARCH	817	69.4	11.8	2690	217.4	12.4
APRIL	744	44.8	16.6	3434	262.2	13.1
MAY	454	36.8	12.3	3888	299.0	13.0
JUNE	540	31.8	17.0	4428	330.8	13.4
JULY	804	68.8	11.7	5232	399.6	13.1
AUGUST	475	32.2	14.8	5707	431.8	13.2
SEPTEMBER	740	58.2	12.7	6447	490.0	13.2
OCTOBER	478	30.8	15.5	6925	520.8	13.3
NOVEMBER	1168	81.4	14.3	8093	602.2	13.4
DECEMBER	517	42.1	12.3	8610	644.3	13.4
JANUARY	642	52.2	12.3	9252	696.5	13.3
FEBRUARY	129	5.0	25.8	9381	701.5	13.4
MARCH	547	45.6	12.0	9928	747.1	13.3
APRIL	561	43.8	12.8	10489	790.9	13.3
MAY	704	49.2	14.3	11193	840.1	13.3
JUNE	706	58.0	12.2	11899	898.1	13.2
JULY	562	37.2	15.1	12461	935.3	13.3

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP FORD ESCORT
VEHICLE USA #: CN0542 ENGINE TYPE: I-4 S.A.D.P. METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
NOVEMBER	9	0.0	0.0	9	0.0	0.0
DECEMBER	911	85.0	10.7	920	85.0	10.8
FEBRUARY	98	6.0	16.3	1018	91.0	11.2
MARCH	141	18.4	7.7	1159	109.4	10.6
APRIL	214	22.6	9.5	1373	132.0	10.4
MAY	285	16.3	17.5	1658	148.3	11.2
JUNE	65	9.0	7.2	1723	157.3	11.0
JULY	134	19.0	7.1	1857	176.3	10.5
AUGUST	202	14.9	13.6	2059	191.2	10.8
SEPTEMBER	122	9.9	12.3	2181	201.1	10.8
OCTOBER	834	57.7	14.5	3015	258.8	11.6
NOVEMBER	1167	76.5	15.3	4182	335.3	12.5
JANUARY	101	5.8	17.4	4283	341.1	12.6
FEBRUARY	305	24.8	12.3	4588	365.9	12.5
MARCH	177	23.8	7.4	4765	389.7	12.2
APRIL	161	17.0	9.5	4926	406.7	12.1
MAY	195	15.5	12.6	5121	422.2	12.1
JUNE	178	6.0	29.7	5299	428.2	12.4
JULY	136	19.0	7.2	5435	447.2	12.2

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP
VEHICLE USA #: CN0543

FORD ESCORT
ENGINE TYPE: I-4

S.A.D.P. METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
NOVEMBER	19	0.0	0.0	19	0.0	0.0
DECEMBER	626	82.2	7.6	645	82.2	7.8
FEBRUARY	586	78.9	7.4	1231	161.1	7.6
MARCH	753	58.2	12.9	1984	219.3	9.0
APRIL	567	37.9	15.0	2551	257.2	9.9
MAY	267	20.0	13.4	2818	277.2	10.2
JUNE	38	8.9	4.3	2856	286.1	10.0
JULY	273	14.4	19.0	3129	300.5	10.4
AUGUST	286	30.4	9.4	3415	330.9	10.3
SEPTEMBER	1559	86.0	18.1	4974	416.9	11.9
OCTOBER	211	17.2	12.3	5185	434.1	11.9
NOVEMBER	3	23.5	.1	5188	457.6	11.3
DECEMBER	1	8.4	.1	5189	466.0	11.1
JANUARY	992	39.4	25.2	6181	505.4	12.2
FEBRUARY	491	51.5	9.5	6672	556.9	12.0
MARCH	575	49.7	11.6	7247	606.6	11.9
APRIL	240	20.9	11.5	7487	627.5	11.9
MAY	170	21.6	7.9	7657	649.1	11.8
JULY	76	10.9	7.0	7733	660.0	11.7

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP FORD ESCORT
VEHICLE USA #: CN0544 ENGINE TYPE: I-4 S.A.D.P. METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
NOVEMBER	79	9.0	8.8	79	9.0	8.8
DECEMBER	334	25.7	13.0	413	34.7	11.9
JANUARY	1043	45.5	22.9	1456	80.2	18.2
FEBRUARY	341	28.2	12.1	1797	108.4	16.6
MARCH	393	38.9	10.1	2190	147.3	14.9
APRIL	177	20.7	8.6	2367	168.0	14.1
MAY	121	15.1	8.0	2488	183.1	13.6
JUNE	1905	121.6	15.7	4393	304.7	14.4
JULY	2588	161.2	16.1	6981	465.9	15.0
AUGUST	2185	138.5	15.8	9166	604.4	15.2
SEPTEMBER	1428	96.0	14.9	10594	700.4	15.1
DECEMBER	2	15.0	.1	10596	715.4	14.8
JANUARY	645	50.3	12.8	11241	765.7	14.7
FEBRUARY	752	84.7	8.9	11993	850.4	14.1
MARCH	523	53.5	9.8	12516	903.9	13.8
APRIL	250	24.5	10.2	12766	928.4	13.8
MAY	784	52.0	15.1	13550	980.4	13.8
JUNE	760	58.3	13.0	14310	1038.7	13.8
JULY	568	41.8	13.6	14878	1080.5	13.8

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP FORD ESCORT
VEHICLE USA #: CN0545 ENGINE TYPE: I-4 S.A.D.P. METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
NOVEMBER	6	0.0	0.0	6	0.0	0.0
DECEMBER	1198	107.1	11.2	1204	107.1	11.2
FEBRUARY	2121	167.9	12.6	3325	275.0	12.1
MARCH	2595	243.2	10.7	5920	518.2	11.4
APRIL	742	68.6	10.8	6662	586.8	11.4
MAY	1143	83.6	13.7	7805	670.4	11.6
JUNE	554	66.5	8.3	8359	736.9	11.3
JULY	514	54.5	9.4	8873	791.4	11.2
AUGUST	630	61.4	10.3	9503	852.8	11.1
SEPTEMBER	642	45.9	14.0	10145	898.7	11.3
JANUARY	360	24.0	15.0	10505	922.7	11.4
FEBRUARY	110	9.7	11.3	10615	932.4	11.4
MARCH	28	6.0	4.7	10643	938.4	11.3
APRIL	243	16.0	15.2	10886	954.4	11.4
MAY	454	28.7	15.8	11340	983.1	11.5
JUNE	584	43.7	13.4	11924	1026.8	11.6
JULY	227	16.0	14.2	12151	1042.8	11.7

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP — FORD ESCORT
VEHICLE USA #: CN0546 — ENGINE TYPE: I-4 — S.A.D.P. METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
NOVEMBER	2	0.0	0.0	2	0.0	0.0
DECEMBER	902	100.2	9.0	904	100.2	9.0
JANUARY	415	45.3	9.2	1319	145.5	9.1
FEBRUARY	1630	148.0	11.0	2949	293.5	10.0
MARCH	527	53.8	9.8	3476	347.3	10.0
APRIL	1951	171.2	11.4	5427	518.5	10.5
MAY	327	62.6	5.2	5754	581.1	9.9
JUNE	1162	114.7	10.1	6916	695.8	9.9
JULY	1451	133.3	10.9	8367	829.1	10.1
AUGUST	332	32.1	10.3	8699	861.2	10.1
SEPTEMBER	664	51.4	12.9	9363	912.6	10.3
OCTOBER	295	26.8	11.0	9658	939.4	10.3
NOVEMBER	278	21.6	12.9	9936	961.0	10.3
DECEMBER	1298	98.8	13.1	11234	1059.8	10.6
JANUARY	696	62.2	11.2	11930	1122.0	10.6
FEBRUARY	133	18.5	7.2	12063	1140.5	10.6
MARCH	501	56.4	8.9	12564	1196.9	10.5
APRIL	435	31.0	14.0	12999	1227.9	10.6
MAY	405	37.1	10.9	13404	1265.0	10.6
JUNE	276	51.0	5.4	13680	1316.0	10.4
JULY	252	25.7	9.9	13932	1341.7	10.4

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP FORD ESCORT
VEHICLE USA #: CN0547 ENGINE TYPE: I-4 S.A.D.P. METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
DECEMBER	1	0.0	0.0	1	0.0	0.0
JANUARY	55	10.6	5.2	56	10.6	5.3
FEBRUARY	89	10.0	8.9	145	20.6	7.0
MARCH	1563	109.5	14.3	1708	130.1	13.1
APRIL	2748	158.2	17.4	4456	288.3	15.5
MAY	451	35.3	12.8	4907	323.6	15.2
JUNE	1444	72.2	20.0	6351	395.8	16.0
JULY	190	18.2	10.4	6541	414.0	15.8
AUGUST	704	40.8	17.3	7245	454.8	15.9
SEPTEMBER	334	24.2	13.8	7579	479.0	15.8
OCTOBER	1341	88.1	15.2	8920	567.1	15.7
NOVEMBER	2683	145.2	18.5	11603	712.3	16.3
DECEMBER	142	13.8	10.3	11745	726.1	16.2
JANUARY	342	30.9	11.1	12087	757.0	16.0
FEBRUARY	261	17.8	14.7	12348	774.8	15.9
MARCH	454	38.4	11.8	12802	813.2	15.7
APRIL	223	16.9	13.2	13025	830.1	15.7
MAY	252	20.5	12.3	13277	850.6	15.6
JUNE	81	10.0	8.1	13358	860.6	15.5
JULY	183	18.0	10.2	13541	878.6	15.4

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP FORD ESCORT
VEHICLE USA #: CH0548 ENGINE TYPE: I-4 S.A.D.P. METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
DECEMBER	92	9.0	10.2	92	9.0	10.2
JANUARY	120	13.0	9.2	212	22.0	9.6
FEBRUARY	178	11.5	15.5	390	33.5	11.6
MARCH	95	12.1	7.9	485	45.6	10.6
APRIL	284	28.9	9.8	769	74.5	10.3
MAY	1145	67.7	16.9	1914	142.2	13.5
JUNE	199	18.0	11.1	2113	160.2	13.2
JULY	135	8.0	16.9	2248	168.2	13.4
AUGUST	337	24.6	13.7	2585	192.8	13.4
SEPTEMBER	260	26.5	9.8	2845	219.3	13.0
OCTOBER	238	14.8	16.1	3083	234.1	13.2
NOVEMBER	3	30.2	.1	3086	264.3	11.7
DECEMBER	3	30.0	.1	3089	294.3	10.5
JANUARY	1164	21.7	53.6	4253	316.0	13.5
MARCH	54	8.5	6.4	4307	324.5	13.3
APRIL	56	0.0	0.0	4363	324.5	13.4
MAY	104	9.0	11.6	4467	333.5	13.4
JUNE	134	15.4	8.7	4601	348.9	13.2
JULY	81	0.0	0.0	4682	348.9	13.4

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP
VEHICLE USA #: CN0549

FORD ESCORT
ENGINE TYPE: I-4

S.A.D.P. METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
DECEMBER	117	7.0	16.7	117	7.0	16.7
JANUARY	639	65.3	9.8	756	72.3	10.5
FEBRUARY	751	64.9	11.6	1507	137.2	11.0
MARCH	724	60.0	12.1	2231	197.2	11.3
APRIL	448	37.0	12.1	2679	234.2	11.4
MAY	444	29.7	14.9	3123	263.9	11.8
JUNE	219	12.0	18.3	3342	275.9	12.1
JULY	103	7.0	14.7	3445	282.9	12.2
AUGUST	86	9.0	9.6	3531	291.9	12.1
SEPTEMBER	433	13.3	32.6	3964	305.2	13.0
OCTOBER	1	7.5	.1	3965	312.7	12.7
NOVEMBER	4	31.5	.1	3969	344.2	11.5
DECEMBER	347	0.0	0.0	4316	344.2	12.5
JANUARY	81	7.6	10.7	4397	351.8	12.5
FEBRUARY	80	11.9	6.7	4477	363.7	12.3
MARCH	210	18.9	11.2	4687	382.5	12.3
APRIL	199	14.4	13.8	4886	396.9	12.3
MAY	141	15.0	9.4	5027	411.9	12.2
JUNE	133	6.8	19.6	5160	418.7	12.3
JULY	40	5.9	6.8	5200	424.6	12.2

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP FORD ESCORT
VEHICLE USA #: CN0550 ENGINE TYPE: I-4 S.A.D.P. METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
JANUARY	690	62.2	10.9	680	62.2	10.9
FEBRUARY	439	44.0	10.0	1119	106.2	10.5
MARCH	577	40.2	14.4	1696	146.4	11.6
APRIL	391	34.0	11.5	2087	180.4	11.6
MAY	293	10.0	29.3	2380	190.4	12.5
JUNE	312	33.0	9.5	2692	223.4	12.1
JULY	130	31.5	4.1	2822	254.9	11.1
AUGUST	889	74.3	12.0	3711	329.2	11.3
SEPTEMBER	877	50.2	17.5	4588	379.4	12.1
OCTOBER	134	9.3	14.4	4722	388.7	12.1
NOVEMBER	85	8.0	10.6	4807	396.7	12.1
DECEMBER	19	7.0	2.7	4826	403.7	12.0
JANUARY	15	10.0	1.5	4841	413.7	11.7
FEBRUARY	70	7.4	9.5	4911	421.1	11.7
MARCH	54	7.0	7.7	4965	428.1	11.6
APRIL	57	8.0	7.1	5022	436.1	11.5
MAY	45	0.0	0.0	5067	436.1	11.6
JUNE	436	34.8	12.5	5503	470.9	11.7
JULY	361	28.0	12.9	5864	498.9	11.8

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP FORD ESCORT
VEHICLE USA #: CN0551 ENGINE TYPE: I-4 S.A.D.P METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
NOVEMBER	99	9.0	11.0	99	9.0	11.0
DECEMBER	323	25.1	12.9	422	34.1	12.4
JANUARY	578	36.3	15.9	1000	70.4	14.2
FEBRUARY	450	33.0	13.6	1450	103.4	14.0
MARCH	30	10.0	3.0	1480	113.4	13.1
APRIL	184	18.0	10.2	1664	131.4	12.7
MAY	466	28.1	16.6	2130	159.5	13.4
JUNE	499	42.5	11.7	2629	202.0	13.0
JULY	300	27.7	10.8	2929	229.7	12.8
AUGUST	424	32.0	13.2	3353	261.7	12.8
SEPTEMBER	399	25.5	15.6	3752	287.2	13.1
OCTOBER	253	25.0	10.1	4005	312.2	12.8
NOVEMBER	345	23.6	14.6	4350	335.8	13.0
DECEMBER	151	27.9	5.4	4501	363.7	12.4
JANUARY	243	16.0	15.2	4744	379.7	12.5
FEBRUARY	101	8.0	12.6	4845	387.7	12.5
MARCH	389	26.8	14.5	5234	414.5	12.6
APRIL	274	16.0	17.1	5508	430.5	12.8
MAY	268	16.0	16.8	5776	446.5	12.9
JUNE	433	29.5	14.7	6209	476.0	13.0
JULY	365	25.1	14.5	6574	501.1	13.1

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP — FORD ESCORT
VEHICLE USA #: CN0552 — ENGINE TYPE: I-4 — S.A.D.P. METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
NOVEMBER	3	0.0	0.0	3	0.0	0.0
DECEMBER	189	17.4	10.9	192	17.4	11.0
JANUARY	363	43.8	8.3	555	61.2	9.1
FEBRUARY	361	23.5	15.4	916	84.7	10.8
MARCH	78	9.0	8.7	994	93.7	10.6
APRIL	215	10.0	21.5	1209	103.7	11.7
MAY	109	11.0	9.9	1318	114.7	11.5
JUNE	149	10.0	14.9	1467	124.7	11.8
JULY	192	11.0	17.5	1659	135.7	12.2
AUGUST	177	10.0	17.7	1836	145.7	12.6
SEPTEMBER	115	9.0	12.8	1951	154.7	12.6
OCTOBER	68	11.0	6.2	2019	165.7	12.2
NOVEMBER	95	11.0	8.6	2114	176.7	12.0
DECEMBER	69	8.0	8.6	2183	184.7	11.8
JANUARY	111	10.7	10.4	2294	195.4	11.7
FEBRUARY	112	9.0	12.4	2406	204.4	11.8
MARCH	148	0.0	0.0	2554	204.4	12.5
APRIL	101	10.0	10.1	2655	214.4	12.4
MAY	119	9.7	12.3	2774	224.1	12.4
JUNE	162	19.0	8.5	2936	243.1	12.1
JULY	156	7.2	21.7	3092	250.3	12.4

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP
VEHICLE USA #: CN0553

FORD ESCORT
ENGINE TYPE: I-4

S.A.D.P. METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
NOVEMBER	26	0.0	0.0	26	0.0	0.0
DECEMBER	550	42.9	12.8	576	42.9	13.4
JANUARY	325	30.3	10.7	901	73.2	12.3
FEBRUARY	237	22.3	10.6	1138	95.5	11.9
MARCH	295	30.3	9.7	1433	125.8	11.4
APRIL	348	22.7	15.3	1781	148.5	12.0
MAY	243	22.6	10.8	2024	171.1	11.8
JUNE	351	30.9	11.4	2375	202.0	11.8
JULY	469	29.0	16.2	2844	231.0	12.3
AUGUST	1350	95.9	14.1	4194	326.9	12.8
SEPTEMBER	807	57.4	14.1	5001	384.3	13.0
OCTOBER	297	15.8	18.8	5298	400.1	13.2
NOVEMBER	362	30.7	11.8	5660	430.8	13.1
DECEMBER	359	41.8	8.6	6019	472.6	12.7
JANUARY	696	56.5	12.3	6715	529.1	12.7
FEBRUARY	225	19.5	11.5	6940	548.6	12.7
MARCH	253	33.5	7.6	7193	582.1	12.4
APRIL	129	11.6	11.1	7322	593.7	12.3
MAY	153	17.5	8.7	7475	611.2	12.2
JUNE	207	19.4	10.7	7682	630.6	12.2
JULY	29	8.9	3.3	7711	639.5	12.1

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP FORD ESCORT
VEHICLE USA #: CN0554 ENGINE TYPE: I-4 S.A.D.P. METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
DECEMBER	148	16.6	8.9	148	16.6	8.9
JANUARY	669	52.3	12.8	817	68.9	11.9
FEBRUARY	114	10.4	11.0	931	79.3	11.7
MARCH	788	47.6	16.6	1719	126.9	13.5
APPIL	1630	115.8	14.1	3349	242.7	13.8
MAY	768	41.5	18.5	4117	284.2	14.5
JUNE	704	59.0	11.9	4821	343.2	14.0
JULY	536	40.0	13.4	5357	383.2	14.0
AUGUST	701	65.0	10.8	6058	448.2	13.5
SEPTEMBER	476	38.4	12.4	6534	486.6	13.4
OCTOBER	401	28.4	14.1	6935	515.0	13.5
NOVEMBER	776	59.0	13.2	7711	574.0	13.4
DECEMBER	498	40.1	12.4	8209	614.1	13.4
JANUARY	478	73.0	6.5	8687	687.1	12.6
FEBRUARY	534	52.2	10.2	9221	739.3	12.5
MARCH	432	38.7	11.2	9653	778.0	12.4
APRIL	199	12.5	15.9	9852	790.5	12.5
MAY	251	21.0	12.0	10103	811.5	12.4

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP FORD ESCORT
VEHICLE USA #: CN0555 ENGINE TYPE: I-4 S.A.D.P. METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
NOVEMBER	64	6.5	9.8	64	6.5	9.8
DECEMBER	353	43.0	8.2	417	49.5	8.4
JANUARY	283	27.1	10.4	700	76.6	9.1
FEBRUARY	194	26.6	7.3	894	103.2	8.7
MARCH	139	11.0	12.6	1033	114.2	9.0
APRIL	64	10.0	6.4	1097	124.2	8.8
MAY	218	28.0	7.8	1315	152.2	8.6
JUNE	254	27.3	9.3	1569	179.5	8.7
JULY	53	9.5	5.6	1622	189.0	8.6
AUGUST	413	40.5	10.2	2035	229.5	8.9
SEPTEMBER	164	14.7	11.2	2199	244.2	9.0
OCTOBER	108	26.3	4.1	2307	270.5	8.5
NOVEMBER	340	29.7	11.4	2647	300.2	8.8
DECEMBER	348	31.8	10.9	2995	332.0	9.0
JANUARY	276	41.0	6.7	3271	373.0	8.8
FEBRUARY	177	25.5	6.9	3448	398.5	8.7
MARCH	260	34.3	7.6	3708	432.8	8.6
APRIL	263	32.9	8.0	3971	465.7	8.5
MAY	433	42.5	10.2	4404	508.2	8.7
JUNE	429	30.8	13.9	4833	539.0	9.0
JULY	373	37.4	10.0	5206	576.4	9.0

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP FORD ESCORT
VEHICLE USA #: CN0556 ENGINE TYPE: I-4 S.A.D.P. METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
DECEMBER	221	10.9	20.3	221	10.9	20.3
JANUARY	193	16.0	12.1	414	26.9	15.4
FEBRUARY	285	24.2	11.8	699	51.1	13.7
MARCH	391	26.4	14.8	1090	77.5	14.1
APRIL	143	19.0	7.5	1233	96.5	12.8
MAY	283	19.2	14.7	1516	115.7	13.1
JUNE	225	20.5	11.0	1741	136.2	12.8
JULY	2267	129.6	17.5	4008	265.8	15.1
AUGUST	1403	74.8	18.8	5411	340.6	15.9
SEPTEMBER	510	36.1	14.1	5921	376.7	15.7
OCTOBER	284	19.5	14.6	6205	396.2	15.7
NOVEMBER	70	10.0	7.0	6275	406.2	15.4
FEBRUARY	636	45.9	13.9	6911	452.1	15.3
MARCH	78	6.0	13.0	6989	458.1	15.3
APRIL	238	10.0	23.8	7227	468.1	15.4
MAY	189	19.1	9.9	7416	487.2	15.2
JUNE	157	10.2	15.4	7573	497.4	15.2
JULY	129	10.0	12.9	7702	507.4	15.2

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: SADP
VEHICLE USA #: CN0557

FORD ESCORT
ENGINE TYPE: I-4

S.A.D.P. METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
NOVEMBER	24	7.0	3.4	24	7.0	3.4
DECEMBER	370	69.7	12.5	394	76.7	11.7
JANUARY	725	68.1	10.6	1519	144.8	11.2
FEBRUARY	584	46.5	12.6	2203	191.3	11.5
MARCH	489	41.8	11.7	2692	233.1	11.5
APRIL	434	35.0	12.4	3126	268.1	11.7
MAY	654	53.6	12.2	3780	321.7	11.8
JUNE	768	56.8	13.5	4548	378.5	12.0
JULY	375	31.1	12.1	4923	409.6	12.0
AUGUST	326	24.5	13.3	5249	434.1	12.1
SEPTEMBER	95	8.5	11.2	5344	442.6	12.1
OCTOBER	224	18.0	12.4	5568	460.6	12.1
NOVEMBER	202	15.5	13.0	5770	476.1	12.1
DECEMBER	215	26.4	8.1	5985	502.5	11.9
JANUARY	436	27.5	15.9	6421	530.0	12.1
FEBRUARY	530	54.3	9.8	6951	584.3	11.9
MARCH	785	49.8	15.8	7736	634.1	12.2
APRIL	482	28.0	17.2	8218	662.1	12.4
MAY	523	40.7	12.9	8741	702.8	12.4
JUNE	503	28.8	17.5	9244	731.6	12.6
JULY	261	26.5	9.8	9505	758.1	12.5

Monthly Cumulative Fuel Reports for Each Vehicle at San Antonio Real Property Maintenance Agency

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: USAF PLYMOUTH RELIANT
VEHICLE USA #: CB9917 ENGINE TYPE: I-4 U.S.A.F. BASELINE VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
JANUARY	574	20.0	28.7	574	20.0	28.7
FEBRUARY	214	7.0	30.6	788	27.0	29.2
MARCH	487	0.0	0.0	1275	27.0	47.2
APRIL	617	33.2	18.6	1892	60.2	31.4
MAY	592	7.5	81.1	2484	67.7	36.8
JUNE	511	13.6	37.6	2995	81.3	36.8
JULY	860	17.0	50.6	3855	98.3	39.2
AUGUST	1319	38.3	34.4	5174	136.6	37.9
SEPTEMBER	960	38.5	24.9	6134	174.1	35.1
OCTOBER	826	29.0	28.5	6960	203.9	34.1
NOVEMBER	600	18.0	33.3	7560	221.9	34.1
DECEMBER	1024	34.6	29.6	8584	256.5	33.5
JANUARY	709	16.0	44.3	9293	272.5	34.1
FEBRUARY	735	0.0	0.0	10028	272.5	36.8
MARCH	962	49.2	19.6	10990	321.7	34.2
APRIL	764	39.6	19.3	11754	360.3	32.6
MAY	1017	31.0	32.8	12771	391.3	32.6
JUNE	928	37.0	25.1	13699	428.3	32.0

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: USAF PLYMOUTH RELIANT
VEHICLE USA #: CB9918 ENGINE TYPE: I-4 U.S.A.F. BASELINE VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
JANUARY	1064	39.0	27.3	1064	39.0	27.3
FEBRUARY	898	30.0	29.9	1962	69.0	28.4
MARCH	936	33.0	28.3	2798	102.0	27.4
APRIL	922	37.0	24.9	3720	139.0	26.8
MAY	1015	21.2	47.9	4735	160.2	29.6
JUNE	1336	40.0	33.4	6071	200.2	30.3
JULY	931	31.7	29.4	7002	231.9	30.2
AUGUST	178	10.5	17.0	7180	242.4	29.6
SEPTEMBER	664	22.0	30.2	7844	264.4	29.7
OCTOBER	451	15.9	28.4	8295	280.3	29.6
NOVEMBER	575	18.0	31.9	8870	298.3	29.7
DECEMBER	389	16.7	23.3	9259	315.0	29.4
JANUARY	529	14.4	36.7	9788	329.4	29.7
FEBRUARY	266	7.0	38.0	10054	336.4	29.9
MARCH	318	17.2	18.5	10372	353.6	29.3
APRIL	294	9.5	30.9	10666	363.1	29.4
MAY	716	21.5	33.3	11382	384.6	29.6
JUNE	558	8.0	69.8	11940	392.6	30.4
JULY	65	0.0	0.0	12005	392.6	30.6

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: USAF — PLYMOUTH RELIANT
VEHICLE USA #: CB9922 — ENGINE TYPE: I-4 — U.S.A.F. BASELINE VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
JANUARY	330	33.0	10.0	330	33.0	10.0
FEBRUARY	575	8.0	71.9	905	46.0	20.8
MARCH	455	17.0	26.8	1414	63.0	22.4
APRIL	946	31.0	30.5	2356	94.0	25.1
MAY	682	15.7	43.4	3038	109.7	27.7
JUNE	630	18.0	35.0	3668	127.7	28.7
JULY	466	13.0	35.8	4134	140.7	29.4
AUGUST	342	14.4	23.7	4476	155.1	28.9
SEPTEMBER	986	29.0	30.6	5361	184.1	29.1
OCTOBER	513	13.0	39.4	5874	197.1	29.8
NOVEMBER	332	12.0	27.7	6206	209.1	29.7
DECEMBER	430	24.8	17.3	6636	233.9	28.4
JANUARY	420	18.0	23.3	7056	251.9	28.0
FEBRUARY	270	0.0	0.0	7326	251.9	29.1
MARCH	409	8.0	51.1	7735	259.9	29.8
APRIL	352	12.9	27.3	8087	272.8	29.6
MAY	1013	37.2	27.2	9100	310.0	29.4
JUNE	139	0.0	0.0	9239	310.0	29.8
JULY	169	0.0	0.0	9408	310.0	30.3

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: USAF — PLYMOUTH RELIANT
VEHICLE USA #: X79115 — ENGINE TYPE: I-4 — U.S.A.F. METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
JANUARY	173	9.0	19.2	173	9.0	19.2
FEBRUARY	629	36.2	17.4	802	45.2	17.7
MARCH	834	45.0	18.5	1636	90.2	18.1
APRIL	867	58.1	14.9	2503	148.3	16.9
MAY	984	67.3	14.6	3487	215.6	16.2
JUNE	889	54.6	16.3	4376	270.2	16.2
JULY	707	54.6	12.9	5083	324.8	15.6
AUGUST	1227	84.4	14.5	6310	409.2	15.4
SEPTEMBER	128	16.0	8.0	6438	425.2	15.1
OCTOBER	662	32.3	20.5	7100	457.5	15.5
NOVEMBER	696	50.1	13.9	7796	507.6	15.4
DECEMBER	521	29.7	18.2	8317	536.3	15.5
JANUARY	450	36.9	12.2	8767	573.2	15.3
FEBRUARY	856	52.3	16.4	9623	625.5	15.4
MARCH	904	64.0	14.1	10527	689.5	15.3
APRIL	1057	75.2	14.1	11584	764.7	15.1
MAY	904	54.8	16.5	12488	819.5	15.2
JUNE	685	56.5	12.1	13173	876.0	15.0
JULY	110	12.0	9.2	13283	888.0	15.0

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: USAF PLYMOUTH RELIANT
VEHICLE USA #: X79116 ENGINE TYPE: I-4 U.S.A.F. METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
JANUARY	215	12.4	17.3	215	12.4	17.3
FEBRUARY	275	16.6	16.6	490	29.0	16.9
MARCH	753	17.0	44.3	1243	46.0	27.0
APRIL	773	45.2	17.1	2016	91.2	22.1
MAY	370	34.5	10.7	2386	125.7	19.0
JUNE	853	54.6	15.6	3239	180.3	18.0
JULY	722	55.5	13.0	3961	235.8	16.8
AUGUST	747	54.6	13.7	4708	290.4	16.2
SEPTEMBER	1149	71.8	16.0	5857	362.2	16.2
OCTOBER	917	62.5	14.7	6774	424.7	16.0
NOVEMBER	784	55.0	14.3	7558	479.7	15.8
DECEMBER	936	65.1	14.4	8494	544.8	15.6
JANUARY	971	61.8	15.7	9465	606.6	15.6
FEBRUARY	500	35.0	14.3	9965	641.6	15.5
MARCH	1127	69.8	16.1	11092	711.4	15.6
APRIL	403	34.8	11.6	11495	746.2	15.4
MAY	483	33.5	14.4	11978	779.7	15.4
JUNE	1074	75.1	14.3	13052	854.8	15.3

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: USAF — PLYMOUTH RELIANT
VEHICLE USA #: X79117 — ENGINE TYPE: I-4 — U.S.A.F. METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
JANUARY	400	19.9	20.1	400	19.9	20.1
FEBRUARY	628	25.1	25.0	1028	45.0	22.8
MARCH	1120	51.5	21.7	2148	96.5	22.3
APRIL	656	43.3	15.2	2804	139.8	20.1
MAY	870	59.7	14.6	3674	199.5	18.4
JUNE	636	43.1	14.8	4310	242.6	17.8
JULY	686	56.0	12.2	4996	298.6	16.7
AUGUST	916	54.8	16.7	5912	353.4	16.7
SEPTEMBER	648	46.1	14.1	6560	399.5	16.4
OCTOBER	956	66.8	14.3	7516	466.3	16.1
NOVEMBER	752	52.3	14.4	8268	518.6	15.9
DECEMBER	946	65.9	14.4	9214	584.5	15.8
JANUARY	1162	60.8	19.1	10376	645.3	16.1
FEBRUARY	541	39.9	13.6	10917	685.2	15.9
MARCH	1118	67.2	16.6	12035	752.4	16.0
APRIL	314	15.4	20.4	12349	767.8	16.1
MAY	489	25.7	19.0	12838	793.5	16.2
JUNE	812	59.0	13.8	13650	852.5	16.0

OPERATIONAL DATA FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

MONTHLY CUMULATIVE VEHICLE REPORT

POST/ACTIVITY: USAF — PLYMOUTH RELIANT
VEHICLE USA #: X79118 — ENGINE TYPE: I-4 — U.S.A.F. METHANOL VEHICLE

MONTH	MONTHLY MILES	MONTHLY GALLONS	MONTHLY MPG	CUMUL MILES	CUMUL GALLONS	CUMUL MPG
JANUARY	213	15.9	13.4	213	15.9	13.4
FEBRUARY	1134	65.3	17.4	1347	81.2	16.6
MARCH	1166	39.9	29.2	2513	121.1	20.8
APRIL	904	77.9	11.6	3417	199.0	17.2
MAY	468	26.2	17.9	3885	225.2	17.3
JUNE	893	55.0	16.2	4778	280.2	17.1
JULY	833	59.7	14.0	5611	339.9	16.5
AUGUST	561	26.8	20.9	6172	366.7	16.8
SEPTEMBER	501	47.3	10.6	6673	414.0	16.1
OCTOBER	1095	64.3	17.0	7768	478.3	16.2
NOVEMBER	857	44.3	19.3	8625	522.6	16.5
DECEMBER	1068	67.4	15.8	9693	590.0	16.4
JANUARY	677	38.0	17.8	10370	628.0	16.5
FEBRUARY	622	40.0	15.5	10992	668.0	16.5
MARCH	933	65.0	14.4	11925	733.0	16.3
APRIL	688	66.0	10.4	12613	799.0	15.8
MAY	976	64.8	15.1	13589	863.8	15.7
JUNE	932	66.3	14.1	14521	930.1	15.6

APPENDIX D

FUEL SAMPLING PROCEDURE FOR USE IN THE ARMY METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION PROGRAM

APPENDIX D

FUEL SAMPLING PROCEDURE FOR USE IN THE ARMY METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION PROGRAM

Fuel Samples

Purpose. Fuel samples will be taken and evaluated to determine the quality consistency of the methanol fuel delivered for use in the Army Methanol-Fueled Administrative Vehicle Demonstration Program.

Sampling Schedule. Presidio of San Francisco - a fuel sample will be taken by Army personnel from the new 550-gal refueling tank, supplied by JPL, each time the refueling tank is refilled with more than 200 gal from a BofA fuel dispensing station.

Fort Ord and Sierra Army Depot - a fuel sample will be taken by Army personnel from the bulk fuel tanker delivering methanol fuel to the refueling facilities each time a fuel delivery is made. In addition, a sample will be drawn from the refueling pump approximately 8 to 24 hrs after receipt of each bulk fuel delivery.

Sample Containers. One gallon, ICC approved, unlined, steel cans (to be supplied by BFLRF with shipping labels) will be used to take and ship the methanol fuel samples. These cans meet Government Specification DOT 17E and can be shipped without being enclosed in another container if necessary. Before introducing the sample, visually inspect the sample cans to ensure they are free of rust and do not contain any extraneous materials such as oil, dirt, dust, etc. If cans are rusty, do not use for samples. If foreign material cannot be removed by rinsing as described under sampling procedure, do not use for samples. Do not permit cans to get hot from being in direct sunlight for a long period of time before introducing the sample. Also, it is very important that filled sample cans not be allowed to sit in direct sunlight or placed in rooms with very warm temperatures since exposure to such heat degrades the sample.

Sampling Procedure. The following sampling procedure will be used for the methanol fuel:

a. Purge filler hose and valve by discharging at least 3 times the hose volume through the hose and valve. If a methanol vehicle is at the pump storage tank for refueling, 2 to 5 gallons could be pumped into the vehicle before the sample is taken. Otherwise, a "slop" can must be provided. Disposition of the "slop" can will be in accordance with local SOP.

b. After purging, partially fill the sample container with fuel (about one-third full). Cap, shake vigorously, and discard this rinse fuel. Repeat for a total of three rinses.

c. Fill each rinsed container with the sampled fuel to within not less than one and one-half inches from the top. This space is for expansion of fuel if exposed to heat for any length of time.

d. For the metal sample containers, a metal shipping insert is to be rinsed with fuel immediately before inserting into the can opening. Make sure the insert is clean. This insert is vital to the sealing of the sample containers and must fit flat in the opening and be level with or slightly below the rim of the opening. If the insert does not go in easily, use a round, flat object (such as a 1-inch socket) slightly smaller than the insert to gently force it into place. Take care, for if the insert is bent, it will not seal. Make sure you can read "PRY OUT" printed on the insert.

e. Place the screw cap on the can and tighten as tight as possible by hand.

f. Place all filled, capped containers on their side for about 30 minutes to check for leaks. If further tightening is necessary to stop leakage, channel-lock or water pump pliers may be used on the metal cap, taking care to avoid damaging the cap.

Shipping. All fuel samples are to be shipped to BFLRF as follows:

a. All samples will be airshipped to BFLRF by Federal Express or other comparable air shipping service for next day arrival.

b. Each 1-gallon sample can will be placed in a carton provided for shipping purposes.

c. The carton will be marked as follows:

1. "FLAMMABLE LIQUID" label (Red w/White lettering)

2. "DANGER-PELIGRO" label (Orange w/Black lettering)

3. A label bearing the following information:

"The container in this box meets the Federal Specification for the fuel being shipped therein."

4. A label bearing the following information:

Fuel-Methanol Alcohol
FLAMMABLE LIQUID
UN-1230
Flash point: 54°F (12°C)

d. Cartons, with appropriate shipping labels, will be provided by BFLRF.

e. Samples will be shipped to:

Southwest Research Institute
Belvoir Fuels and Lubricants Research Facility
Attn: B.B. Baber, Bldg. 99
6220 Culebra Road
San Antonio, TX 78228-0510

Analyses. Upon receipt of the samples, fuel analyses conducted by BFLRF will include, but not limited to, the following evaluations:

Evaluation	Method
GC analysis of hydrocarbons and oxygenates	BFLRF
Specific Gravity	D 1217
Color	D 156
Copper Corrosion	D 130
Reid Vapor Pressure (auto)	SwRI
Sulfur	D 3120 & ICP
Gum	D 381
Lead	D 3237
Distillation	D 86
Chloride Content, Organic & Inorganic	D 3120 modified
Phosphorus Content	D 3231
Water	D 1744
Particulate Contaminants	D 2276 & HIAC
Acidity	D 1613

Reporting. The results obtained from the fuel analyses will be reported by letter to JPL and the supplying activity, along with any pertinent comments relative to the results obtained.

APPENDIX E

LUBRICANT AND TRACE METAL DATA

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

VEHICLE USA #: C88917 ENGINE TYPE: I-4 CHRYSLER K-CAR USAF BASELINE VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	OFLRF CODE
CHRYSLER "K" CAR W/TBI ENGINE																					
12-31-86	8897	74.7	11.4	145	1.23	3.48	0.0	11	4	4	0	3	0	0	15	43	1050	310	900	1270	15703
01-30-87	9574	62.6	10.2	150	1.85	4.83	0.0	20	7	10	2	3	0	0	24	38	970	310	1270	1060	15034
05-12-87	11145	90.3	10.6	100	1.91	6.62	0.0	11	6	6	0	3	0	0	11	7	630	800	1190	1430	16066
06-23-87	11851	78.5	10.4	116	1.68	4.49	0.0	13	7	7	0	3	0	0	12	5	620	800	1210	1550	16233
OIL CHANGE AT 11851 MILES																					
07-23-87	12486	71.5	10.8	140	1.68	7.63	0.0	6	11	3	0	3	0	0	8	2	620	1310	800	1220	16460
09-15-87	14824	81.6	11.8	138	2.59	5.61	0.0	12	9	7	0	9	0	0	14	2	500	1260	1060	1180	16665
OIL CHANGE AT 14824 MILES																					
10-15-87	15764	68.4	10.4	139	2.81	4.60	0.0	12	9	3	0	5	0	0	10	31	1230	360	1190	1460	16880
01-05-88	17848	70.5	10.4	133	.11	3.14	0.0	13	11	6	0	7	0	0	120	12	790	290	860	1180	17096
OIL CHANGE AT 17848 MILES																					
02-05-88	18791	67.5	10.8	150	2.69	5.27	0.0	13	13	4	0	7	0	0	10	3	690	1490	1070	1400	17221
04-22-88	20931	69.5	11.1	152	3.59	4.71	0.0	21	14	7	0	7	2	0	10	3	1080	2370	1130	1850	17555
OIL CHANGE AT 20931 MILES																					
05-23-88	21595	67.5	10.6	146	1.80	6.96	0.0	10	9	3	0	0	0	0	14	8	840	1740	1210	1570	17639
07-01-88	22754	67.3	10.9	153	2.75	5.16	0.0	11	7	5	0	7	1	0	16	6	620	1540	940	1300	17849

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

REVISION DATE: AUG 11, 1988

VEHICLE USA #: C88918 ENGINE TYPE: I-4 CHRYSLER K-CAR USAF BASELINE VEHICLE

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	OFLPF CODE
CHRYSLER "K" CAR W/TBI ENGINE																					
12-30-86	14950	69.5	10.5	130	2.52	4.60	0.0	5	3	0	0	2	0	0	20	48	1230	270	1040	1300	15792
01-30-87	16036	63.3	9.3	126	2.50	4.38	0.0	11	4	3	0	5	0	0	24	36	900	250	1220	1020	15835
04-02-87	17906	60.4	10.5	142	3.59	4.15	0.0	12	4	4	0	5	0	0	19	19	920	250	910	1140	15904
OIL CHANGE AT 17907 MILES																					
05-12-87	19146	73.2	11.7	152	1.80	5.39	0.0	9	7	3	0	4	0	0	15	4	800	1500	1000	1420	16065
07-15-87	21664	82.2	11.4	129	2.50	6.28	0.0	13	7	4	0	5	0	0	10	12	870	1460	1230	1480	16425
OIL CHANGE AT 21664 MILES									1												
01-21-88	24660	72.1	10.7	136	4.15	3.14	0.0	10	6	3	0	4	0	0	10	16	680	260	760	1050	17191
OIL CHANGE AT 24660 MILES																					
07-06-88	27199	68.3	10.6	144	1.96	5.02	0.0	10	7	6	0	7	1	0	54	24	520	2250	1060	1550	17858

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

VEHICLE USA #: CB0922 ENGINE TYPE: I-4 CHRYSLER K-CAR USAF BASELINE VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
CHRYSLER "K" CAR W/TBI ENGINE																					
12-31-86	12400	60.8	11.0	151	2.52	4.49	.5	5	1	0	0	2	0	0	12	45	1250	310	1060	1320	15784
01-30-87	13044	53.5	9.0	149	2.36	4.71	0.0	12	6	3	0	3	0	0	26	39	1010	300	1220	1000	15833
05-28-87	15705	69.3	10.6	141	3.65	3.14	0.0	17	6	27	3	7	0	0	32	25	1240	240	1260	1160	16103
OIL CHANGE AT 15705 MILES																					
OIL CHANGE AT 18789 MILES																					
12-10-87	19154	67.2	10.9	153	2.02	6.96	0.0	9	8	5	0	5	0	0	0	3	750	1640	1150	1300	17041
05-18-88	21759	76.6	11.6	145	2.69	5.72	0.0	18	14	8	0	4	1	0	24	1	630	1740	890	1390	17637
OIL CHANGE AT 21759 MILES																					
06-21-88	21901	75.9	12.0	154	2.81	7.41	0.0	7	4	1	0	1	0	0	12	66	970	1100	1190	1330	17803
07-06-88	22114	81.6	12.4	149	1.96	6.23	0.0	10	6	2	0	5	0	0	15	64	740	1170	1000	1370	17840

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CK2364 ENGINE TYPE: L-4 CHEV CITATION PRESIDIO BASELINE VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mo	Si	B	Mg	Ca	P	Zn	BFLRF CODE
10-04-85	22871	74.6	11.5	147	2.76	2.57	1.0	13	15	94	<1	<1	<1	<1	14	47	1029	9	843	807	14676
10-15-85	23237	74.4	11.6	150	2.64	2.30	1.1	16	23	97	5	<1	<1	<1	16	36	1069	10	848	925	14657
OIL CHANGE AT 23237 MILES																					
11-07-85	24330	123.3	13.1	100	2.41	2.92	1.3	11	10	24	1	3	<1	<1	16	100	1232	10	1140	1093	14695
11-29-85	25650	133.6	14.1	103	3.29	2.61	.6	13	21	26	3	3	1	<1	15	50	1220	10	1143	1140	14734
12-16-85	27005	135.7	14.1	101	4.55	2.63	1.6	35	52	29	5	5	2	<1	19	44	1215	19	1210	1102	14812
OIL CHANGE AT 27005 MILES																					
12-17-85	27006	148.3	14.7	98	2.80	6.22	.3	5	13	5	1	1	2	1	27	184	1254	31	1236	1180	14821
01-07-86	27447	132.5	13.6	98	2.51	5.02	1.3	13	9	10	<1	1	<1	<1	16	112	1300	19	1203	1162	14828
01-29-86	30080	121.0	13.5	107	4.63	1.79	1.0	35	45	12	6	3	1	<1	20	25	955	394	1195	1191	14883
02-11-86	31376	103.2	13.0	122	3.82	2.66	1.0	33	41	11	3	3	4	<1	18	3	719	690	1206	1240	14898
OIL CHANGE AT 31376 MILES																					
02-11-86	31377	145.0	14.4	97	2.75	7.70	.3	4	2	2	<1	<1	5	<1	26	4	1165	68	1194	1120	14891
03-14-86	32370	135.9	13.8	97	2.99	3.66	1.0	19	10	8	4	2	1	<1	18	113	1277	82	212	1170	14975
03-24-86	33327	139.3	14.0	97	3.77	2.75	1.1	29	23	8	3	3	1	<1	16	72	1149	84	1160	1084	14988
04-11-86	34729	110.4	13.3	116	3.56	2.73	1.1	34	30	8	5	3	<1	<1	13	31	837	385	1065	1100	15027
04-23-86	36197	84.7	11.5	127	3.39	2.70	3.6	54	36	8	4	4	1	1	19	23	731	547	1140	1192	15056
08-15-86	38053	80.1	11.8	138	2.56	5.16	< .5	33	14	90	0	3	0	0	16	60	960	50	848	1070	15307
OIL CHANGE AT 38053 MILES																					
08-15-86	38054	140.0	14.0	96	2.36	6.96	< .5	2	1	4	3	0	0	0	13	105	1320	38	1238	1250	15306
09-05-86	39807	122.4	12.1	86	2.86	6.11	1.0	19	8	20	2	<1	0	0	9	121	1110	38	1170	1180	15394
03-10-87	47814	143.7	19.9	160	0.42	0.00	0.0	57	28	9	0	13	0	0	6	5	220	60	300	520	15950
OIL CHANGE AT 47822 MILES																					
03-10-87	47823	137.2	13.8	96	3.82	11.78	0.0	2	3	3	4	2	0	0	8	163	1080	20	1360	1270	15951

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CK2366 ENGINE TYPE: L-4 CHEV CITATION PRESIDIO BASELINE VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL OIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
OIL CHANGE AT 28500 MILES																					
11-25-85	30503	73.1	11.1	142	4.32	1.92	1.9	93	49	97	5	9	4	1	39	35	1064	44	946	993	14732
12-12-85	31720	85.8	12.5	144	5.58	1.56	1.9	118	61	102	5	10	4	2	39	26	1045	44	887	962	14803
OIL CHANGE AT 31720 MILES																					
01-07-86	31969	120.8	12.9	100	2.66	5.01	1.4	28	10	21	2	3	1	<1	32	150	1217	22	1145	1133	14826
OIL CHANGE AT 31969 MILES																					
01-07-86	31970	146.4	14.2	94	2.79	7.36	.3	3	2	5	<1	1	1	<1	26	173	1245	17	1160	1097	14827
02-04-86	34893	94.9	11.8	114	3.61	2.74	2.3	31	21	12	5	3	4	<1	19	43	851	362	1124	1113	14873
02-12-86	35005	85.0	11.2	120	2.94	2.76	2.7	52	17	20	2	3	<1	<1	10	3	801	310	1043	905	14888
OIL CHANGE AT 35005 MILES																					
02-12-86	35006	143.7	14.1	95	2.78	8.13	.4	4	<1	3	<1	<1	5	<1	27	4	1181	36	1194	1181	14889
03-10-86	36241	140.5	14.1	97	3.79	3.10	.9	22	13	7	2	1	<1	<1	17	74	1172	51	1170	1132	14967
08-15-86	41540	130.8	14.4	103	4.94	2.13	.5	82	35	17	2	9	0	0	23	23	920	350	1220	1320	15308
OIL CHANGE AT 41543 MILES																					
08-15-86	41544	150.6	14.4	93	2.41	7.69	< .5	3	1	4	3	0	0	0	10	195	1440	30	1340	1320	15309
09-05-86	44344	158.7	15.6	100	5.22	3.48	1.5	52	13	13	4	6	0	0	15	37	1090	50	1150	1100	15396
09-22-86	45998	156.3	16.7	114	5.39	1.60	< .5	59	10	14	7	5	0	0	22	29	550	170	1260	1090	15456
OIL CHANGE AT 45998 MILES																					
09-22-86	45999	134.8	14.5	107	2.92	9.43	< .5	0	4	3	4	0	0	0	8	161	1250	30	1360	1250	15460
11-18-86	46722	115.9	13.8	106	2.69	7.06	0.0	32	9	8	0	5	0	0	10	103	1790	40	1150	1070	15562
12-09-86	47501	140.4	14.6	103	3.09	6.51	0.0	53	15	15	7	8	0	0	14	91	1430	50	1300	1160	15659

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CK2366 ENGINE TYPE: L-4 CHEV CITATION PRESIDIO BASELINE VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLSF CODE
01-20-87	49357	135.0	15.6	120	4.71	4.49	0.0	59	19	19	3	7	0	0	19	27	1420	280	1390	1310	16229

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2670 ENGINE TYPE: L-4 CHEV S-10 FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
06-06-85	569	51.3	8.9	154	1.75	4.94	1.5	60	56	108	22	1	14	4	332	107	987	130	952	1000	14264
08-29-85	2627	54.1	9.2	152	3.85	2.00	1.7	90	123	97	30	2	140	7	420	62	977	80	926	1069	14591
OIL CHANGE AT 2627 MILES																					
10-30-85	3782	71.0	10.0	141	2.08	3.26	2.0	22	29	23	10	1	3	1	60	60	489	1360	1005	1169	14709
01-06-86	4775	81.0	11.4	131	3.84	3.53	2.1	45	81	34	20	3	5	2	103	50	590	1370	1230	1395	14844
OIL CHANGE AT 4775 MILES																					
02-19-86	5390	78.3	11.1	131	2.02	4.48	2.2	12	19	86	4	0	1	<1	26	113	916	160	945	1041	14900
CONVERTED TO METHANOL AT 5390 MILES and B of A Oil Added																					
New Unused B of A Oil		137.4	14.4	103	3.01	10.61		1	<1	<1	<1	1	<1	<1	20	202	1903	6	1345	1263	14748
05-01-86	6535	122.6	13.5	105	2.93	4.96	.5	103	148	39	27	3	0	3	0	30	1640	01	1371	1332	15130
07-10-86	7674	133.5	19.7	169	3.59	5.33	0.0	241	149	46	39	12	19	0	50	6	1160	60	1230	1170	15310
09-19-86	8790	136.4	14.7	108	7.85	5.16	0.0	289	195	51	40	13	23	0	51	4	1450	100	1120	1430	15426
12-03-86	10000	144.5	14.0	102	7.07	4.83	0.0	381	309	49	35	17	31	0	55	2	1030	80	1290	1320	15609
OIL CHANGE AT 10000 MILES																					
02-17-87	11130	125.4	13.9	108	5.61	6.62	0.0	124	83	38	21	3	12	0	36	14	1480	60	1340	1090	15862
04-20-87	12153	126.8	17.0	147	7.19	3.70	0.0	163	108	30	18	9	15	0	39	2	1370	60	1510	1140	16034
06-15-87	13505	135.5	14.1	101	6.06	3.70	0.0	177	126	52	16	13	14	0	30	15	1340	1260	1200	1260	16219
OIL CHANGE AT 13505 MILES																					
08-30-87	14988	126.6	13.7	105	5.95	6.28	0.0	83	63	28	14	5	0	0	20	11	1450	20	1230	1060	16667
10-14-87	15449	135.9	15.4	117	6.96	5.27	0.0	94	79	31	23	6	10	0	23	3	1760	30	1350	1190	16801

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2879 ENGINE TYPE: L-4 CHEV S-10 FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	DFLRF CODE
06-05-85	360	45.9	8.3	156	1.02	4.26	2.6	41	50	12	16	1	10	4	239	0	56	1116	966	1099	14269
08-30-85	2135	46.7	8.8	144	2.33	1.60	1.4	80	163	22	33	1	120	7	358	4	63	1438	1031	1134	14592
OIL CHANGE AT 2135 MILES																					
12-05-85	3663	79.8	11.3	132	1.90	4.44	1.7	7	26	02	3	<1	<1	<1	22	112	837	281	862	994	14605
OIL CHANGE AT 3665 MILES																					
02-28-86	4810	80.2	11.0	126	3.39	2.52	1.6	13	45	07	8	<1	2	<1	29	97	962	46	897	980	14909
03-07-86	4900	78.8	10.9	126	2.99	1.90	1.8	12	47	07	7	<1	1	<1	27	89	962	49	845	956	14957
CONVERTED TO METHANOL AT 4900 MILES and 8 of A Oil Added																					
New Unused B of A Oil		137.4	14.4	103	3.01	10.61		1	<1	<1	<1	1	<1	<1	20	282	1903	6	1345	1263	14740
05-27-86	5544	117.8	10.5	100	3.42	7.57	.5	76	214	41	35	7	13	0	33	46	1520	88	1250	1110	15162
10-10-86	7723	129.4	15.8	129	4.94	4.71	0.0	98	282	57	47	11	32	0	39	1	1050	149	900	1200	15509
12-05-86	9070	130.9	16.3	125	7.01	3.93	0.0	170	376	61	55	15	37	0	44	1	1150	150	1240	1250	15650
OIL CHANGE AT 9070 MILES																					
03-02-87	11511	134.9	13.4	93	4.60	5.39	0.0	91	133	53	31	6	16	0	34	3	1740	50	1510	1200	15096
04-13-87	12097	135.1	15.0	113	6.85	4.15	0.0	101	161	50	30	7	19	0	27	1	1410	50	1200	1320	16010
OIL CHANGE AT 12098 MILES																					
OIL CHANGE AT 14139 MILES																					
06-15-87	14141	133.3	14.2	105	5.44	7.63	0.0	41	43	33	9	3	6	0	28	14	1690	20	1240	1200	16220
03-29-88	17203	121.0	13.8	112	7.07	4.83	0.0	163	172	0	64	8	19	0	30	1	1340	40	1290	1370	17586

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2000 ENGINE TYPE: V-6 CHEV S-10 FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
05-15-85	20	44.0	8.5	175	2.15	3.25	3.1	55	<1	13	13	2	<1	3	400	<1	7	1179	824	909	14203
08-28-85	3000	40.3	8.3	145	2.58	.70	1.1	169	153	23	51	17	300	10	860	<1	13	1470	1143	1216	14579
OIL CHANGE AT 3000 MILES																					
10-02-85	4202	87.3	12.3	133	2.93	3.59	.7	18	21	7	6	1	12	1	63	69	567	1620	1308	1495	14645
12-06-85	5515	85.4	11.8	130	3.14	2.92	1.3	40	31	9	11	4	6	1	142	43	488	1540	1177	1359	14806
OIL CHANGE AT 5515 MILES																					
01-08-86	6622	89.8	11.9	126	3.19	3.10	1.2	22	12	84	7	4	1	1	46	89	931	203	930	1090	14845
CONVERTED TO METHANOL AT 6622 MILES and B of A Oil Added																					
New Unused B of A Oil		137.4	14.4	103	3.01	10.61		1	<1	<1	<1	1	<1	<1	20	202	1903	6	1345	1263	14748
03-20-86	8129	124.1	13.2	100	3.22	2.75	1.0	65	51	23	14	7	5	1	37	30	1464	140	1130	1161	14977
07-03-86	11152	149.5	19.8	153	4.82	4.50	0.0	151	375	33	55	17	9	0	45	1	1120	520	1300	1150	15220
08-28-86	12583	134.0	14.0	101	5.09	3.61	0.0	246	322	37	56	<0	10	0	49	1	1310	550	1090	1540	15405
10-01-86	13529	115.5	13.2	109	5.67	4.04	0.0	353	333	42	57	20	12	0	55	4	1390	650	1370	1600	15467
OIL CHANGE AT 13530 MILES																					
11-21-86	15226	136.5	14.8	109	4.60	6.40	0.0	70	82	19	11	11	2	0	14	3	1690	90	1110	1150	15579
12-02-86	15409	129.3	12.9	92	2.36	8.42	0.0	74	96	16	8	10	1	0	16	2	1670	810	1240	1360	15607
01-15-87	16508	133.8	15.4	119	4.15	8.87	0.0	70	125	45	27	4	11	0	28	36	1620	50	1540	1130	15827
OIL CHANGE AT 16509 MILES																					
03-06-87	17630	121.0	12.7	97	2.58	6.73	0.0	57	30	10	3	5	0	0	14	5	1360	330	1230	1190	15915
04-17-87	18682	110.1	13.5	111	2.86	3.37	0.0	112	23	14	6	9	1	0	19	1	1040	100	1570	1170	16033
05-05-87	19734	136.4	14.7	100	3.37	3.59	0.0	143	23	14	5	11	3	0	20	0	1070	60	1250	1100	16070
OIL CHANGE AT 19735 MILES																					
06-08-87	20917	128.4	13.6	101	4.15	7.07	0.0	67	14	9	7	7	1	0	12	0	1860	20	1310	1140	16211

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2000 ENGINE TYPE: V-6 CHEV S-10 FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
OIL CHANGE AT 20917 MILES																					
07-17-87	21930	120.4	15.7	130	4.04	7.86	0.0	67	12	9	0	6	1	0	12	0	1560	20	1020	1110	16452
09-08-87	23275	156.1	14.1	85	3.70	5.50	0.0	227	18	11	5	9	3	0	17	22	1290	30	1220	1050	16673
10-16-87	23000	130.1	14.4	110	4.94	4.49	0.0	392	24	17	7	13	5	0	29	3	1560	30	1390	1260	16009

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2001 ENGINE TYPE: V-6 CHEV S-10 FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
05-15-85	61	47.[illegible]	8.9	160	2.00	2.69	2.2	60	38	17	11	2	36	4	466	<1	6	987	1012	1076	14100
08-24-85	2932	49.4	8.6	152	2.22	1.57	1.2	102	120	26	38	8	340	12	988	<1	15	1390	1121	1210	14501
OIL CHANGE AT 2932 MILES																					
10-02-85	3070	84.2	11.8	132	2.70	4.49	.9	33	25	19	6	3	9	1	110	70	524	1600	1327	1506	14643
10-21-85	4045	72.2	10.8	130	2.21	3.91	2.0	30	23	7	11	2	30	1	162	66	460	1550	1242	1369	14700
01-07-86	4743	74.2	10.7	124	3.51	3.45	2.0	44	35	8	14	5	7	2	212	50	490	1520	1222	1300	14846
CONVERTED TO METHANOL AT 4743 MILES and B of A Oil Added																					
New Unused B of A Oil		137.4	14.4	103	3.01	10.61		1	<1	<1	<1	1	<1	<1	20	202	1983	6	1345	1263	14740
03-20-86	5202	120.6	13.0	101	2.31	6.63	.3	47	24	21	11	3	4	1	44	75	1196	143	1084	1131	14970
04-24-86	6067	130.3	13.6	99	3.18	4.65	0.0	61	31	19	8	3	2	2	48	58	1414	760	1195	1170	15060
07-10-86	7163	130.1	13.9	103	5.20	4.70	0.0	96	79	24	21	12	4	0	50	3	1150	120	1150	1120	15290
09-24-86	8180	126.6	14.0	108	5.61	3.82	0.0	147	135	31	30	15	5	0	66	2	1370	350	1350	1400	15464
OIL CHANGE AT 8180 MILES																					
12-04-86	9289	91.5	10.9	104	3.65	6.06	0.0	74	45	16	15	10	2	0	30	6	1270	250	1320	1140	15657
02-24-87	10460	76.5	10.1	114	3.48	2.92	0.0	302	109	12	13	11	5	0	32	0	390	20	1920	890	15905
03-02-87	10506	84.6	10.5	107	3.70	2.81	0.0	393	136	15	17	14	7	0	46	0	690	50	1180	1050	15906
04-17-87	11466	94.1	11.7	114	3.87	1.80	0.0	468	155	24	21	18	7	0	47	0	370	30	1260	1040	16031
OIL CHANGE AT 11467 MILES																					
07-07-87	12626	128.3	14.1	108	4.94	6.28	0.0	120	79	24	8	9	3	0	18	4	1590	40	1310	1210	16428
OIL CHANGE AT 12627 MILES																					
08-25-87	13934	148.3	15.2	103	4.04	8.42	0.0	74	44	14	11	8	2	0	19	16	2110	30	1260	1200	16574
10-16-87	14888	161.0	15.9	101	5.78	6.62	0.0	133	50	26	12	16	2	0	30	11	1760	40	1240	1090	16706
OIL CHANGE AT 16039 MILES																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2002 ENGINE TYPE: V-6 CHEV S-10 FT. GRD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
05-15-85	30	47.7	8.9	168	2.13	4.26	2.4	48	27	16	14	2	26	5	396	<1	9	954	837	992	14204
08-20-85	3067	53.9	8.4	130	2.57	2.11	1.2	136	107	22	37	6	250	11	730	11	403	1190	1174	1257	14588
OIL CHANGE AT 3068 MILES																					
10-15-85	4245	79.0	11.4	134	2.29	3.41	1.4	27	24	9	10	2	9	2	124	68	495	1460	1242	1348	14701
12-06-85	5544	84.2	11.6	129	3.05	2.90	1.0	40	38	7	11	5	6	2	165	38	501	1480	1153	1356	14604
OIL CHANGE AT 5544 MILES																					
01-08-86	6627	85.7	11.5	125	2.80	3.11	1.2	23	16	88	8	3	1	1	54	87	965	243	950	1081	14847
CONVERTED TO METHANOL AT 6627 MILES and B of A Oil Added																					
New Unused B of A Oil		137.4	14.4	103	3.01	10.61		1	<1	<1	<1	1	<1	<1	20	282	1903	6	1345	1263	14748
03-26-86	8071	125.2	13.1	97	1.98	3.85	0.0	44	106	17	11	4	2	2	37	13	1170	310	1230	1250	15015
07-02-86	9987	130.4	13.5	98	6.79	4.04	.1	86	211	21	27	9	5	0	42	3	860	360	1090	1130	15215
08-29-86	11074	127.0	13.9	107	4.82	3.53	0.0	113	232	25	35	12	5	0	50	2	1070	510	1130	1458	15484
OIL CHANGE AT 11094 MILES																					
10-31-86	12275	130.7	14.3	108	4.60	7.63	0.0	35	43	9	9	5	1	0	20	8	1360	50	980	1090	15526
12-12-86	13225	133.5	14.7	111	4.71	5.61	0.0	100	88	15	19	11	3	0	33	4	1680	90	1548	1330	15702
02-27-87	14449	128.0	22.2	200	4.94	4.38	0.0	133	100	13	11	9	3	0	23	2	1210	380	1250	1200	15907
OIL CHANGE AT 14452 MILES																					
04-28-87	15701	139.2	4.4	102	3.14	7.41	0.0	89	36	12	3	7	1	0	20	6	1770	80	1330	1200	16069
07-14-87	17269	148.4	15.5	107	5.84	4.38	0.0	215	60	14	10	13	4	0	29	2	1320	60	1480	1170	16441
OIL CHANGE AT 17270 MILES																					
10-04-87	18298	142.1	15.7	115	4.83	7.52	0.0	74	26	11	7	5	1	0	15	14	2330	50	1430	1150	16752

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2003 ENGINE TYPE: L-4 CHEV S-10 FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
06-04-85	980	49.5	8.6	152	1.99	5.50	1.6	44	37	22	17	2	10	,	227	15	136	1375	1053	1230	14265
09-12-85	3221	53.2	9.0	148	2.64	3.18	1.2	49	67	41	18	1	20	4	202	31	356	1195	907	1077	14560
OIL CHANGE AT 3221 MILES																					
09-18-85	3763	80.9	11.6	136	2.34	4.33	1.2	15	9	10	5	<1	7	<1	47	83	557	2000	1170	1390	14625
11-13-85	4712	79.0	11.2	131	1.38	3.25	1.6	21	34	14	6	<1	2	1	63	68	517	1570	1202	1491	14727
12-05-85	4904	73.9	10.8	133	3.00	3.53	2.2	22	44	13	8	3	3	1	71	58	501	1450	1140	1346	14800
OIL CHANGE AT 4904 MILES																					
01-06-86	5032	79.9	11.4	133	2.08	5.90	2.0	6	16	82	4	1	<1	<1	19	111	890	200	885	983	14840
02-19-86	6090	83.3	11.7	132	3.28	3.25	1.6	15	42	83	7	1	2	<1	29	106	937	200	979	1087	14910
CONVERTED TO METHANOL AT 6090 MILES and B of A Oil Added																					
New Unused B of A Oil		137.4	14.4	103	3.01	10.61		1	<1	<1	<1	1	<1	<1	20	282	1903	6	1345	1263	14740
06-11-86	7012	124.2	14.7	116	5.50	6.90	0.0	53	356	39	47	5	6	7	29	48	1360	60	1220	1110	15192
08-22-86	8153	125.3	14.5	120	8.13	5.16	0.0	79	309	40	43	7	9	0	31	5	1270	70	1080	1250	15397
10-21-86	9200	130.1	13.7	101	5.27	6.17	0.0	108	360	53	50	9	16	0	36	2	1090	650	910	1500	15512
12-16-86	10313	133.5	14.1	103	6.12	4.60	0.0	143	381	50	46	11	16	0	38	2	1200	630	1290	1310	15705
OIL CHANGE AT 10313 MILES																					
06-29-87	12708	133.6	15.4	119	7.52	5.16	0.0	129	149	41	20	10	12	0	28	2	1670	80	1330	1200	16427
10-11-87	13796	132.0	14.2	105	5.27	7.63	0.0	164	61	30	14	12	9	0	37	38	1950	60	1390	1070	16753
04-06-88	14752	136.0	13.4	92	7.29	5.50	0.0	465	168	46	29	22	21	0	65	4	1470	60	1150	1200	17507

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2084 ENGINE TYPE: V-6 CHEV S-10 FT. ORD BASELINE VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
05-15-85	460	35.4	7.0	200	1.39	5.95	4.9	111	89	20	24	10	62	9	761	1	29	2276	976	1126	14189
08-29-85	2588	50.6	9.4	173	3.19	1.99	1.1	188	186	25	42	17	340	13	970	<1	28	2378	1865	1144	14588
OIL CHANGE AT 2589 MILES																					
12-14-85	4648	81.6	11.4	138	4.41	2.75	2.4	61	95	11	17	8	5	3	185	33	479	1798	1275	1428	14849
OIL CHANGE AT 4641 MILES																					
01-31-86	5928	88.8	12.8	128	3.28	1.41	1.3	33	47	88	6	4	3	<1	43	75	1884	234	948	1898	14874
6543-6648 MILES, BFLRL COLD START TEST																					
03-24-86	6547	85.6	11.7	128	3.51	2.35	2.4	53	74	86	7	6	12	1	48	48	956	218	885	1827	15832
OIL CHANGE AT 6648 MILES																					
10-06-86	6673	112.9	12.6	184	2.64	9.76	< .5	26	15	8	5	3	8	8	14	176	1838	38	1318	1328	15478
12-11-86	7669	117.5	13.4	118	3.37	7.63	8.8	52	31	13	7	7	8	8	16	137	1618	48	1338	1168	15694
03-85-87	8256	122.7	13.1	188	4.15	6.48	8.8	65	35	11	5	6	8	8	21	118	1678	28	1228	1118	15989
06-88-87	9486	116.6	13.9	118	5.67	4.68	8.8	98	61	12	7	9	8	8	22	41	1538	198	1288	1198	16218
OIL CHANGE AT 9487 MILES																					
08-06-87	18776	136.6	13.8	97	4.26	7.18	8.8	35	37	7	8	7	8	8	14	114	1738	48	1338	1288	16529
09-84-87	12818	152.6	15.9	188	4.49	5.27	8.8	59	72	8	7	8	8	8	16	79	1738	38	1318	1258	16668
81-22-88	15595	159.6	16.3	187	7.63	3.14	8.8	141	163	13	14	13	8	8	21	34	1648	68	1288	1328	17588

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2085 ENGINE TYPE: V-6 CHEV S-10 FT. ORD BASELINE VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
05-15-85	158	40.6	8.7	159	2.20	5.50	2.2	56	28	23	16	2	29	4	379	<1	13	1350	945	1181	14190
08-29-85	2428	51.5	8.5	141	2.84	1.96	1.8	139	92	34	37	6	210	7	610	<1	20	1640	1169	1256	14502
OIL CHANGE AT 2428 MILES																					
10-21-85	3664	78.5	11.4	136	2.56	3.84	1.4	34	22	12	11	2	9	1	128	58	436	1570	1220	1353	14702
12-16-85	4793	77.2	11.1	133	3.38	2.75	1.6	52	35	14	15	7	8	1	158	32	469	1490	1200	1474	14814
OIL CHANGE AT 4793 MILES																					
02-14-86	6203	84.5	11.5	126	3.45	2.71	1.4	23	13	73	6	2	2	<1	52	64	873	280	944	1054	14911
05-05-86	7435	83.1	11.5	130	3.86	2.14	0.0	74	44	82	13	6	<1	1	<1	28	923	349	1037	1160	15132
OIL CHANGE AT 7435 MILES																					
07-01-86	8572	111.8	13.3	115	4.38	8.08	1.0	23	16	21	5	5	0	0	25	96	1250	40	910	1070	15213
09-23-86	10693	122.8	13.5	106	7.24	5.16	< .5	52	31	24	13	9	0	0	40	47	1740	50	1140	1230	15465
OIL CHANGE AT 10693 MILES																					
10-17-86	11719	91.1	12.0	123	4.04	5.16	0.0	24	15	73	7	5	0	0	23	62	1430	30	900	950	15555
02-09-87	12972	102.6	12.9	121	5.78	2.69	0.0	48	33	72	7	9	0	0	33	30	1090	30	960	860	15858
04-13-87	14143	112.1	14.5	132	7.07	2.02	0.0	85	52	77	10	10	0	0	43	27	1300	40	930	1140	16011
OIL CHANGE AT 14144 MILES																					
OIL CHANGE AT 15345 MILES																					
09-04-87	16474	119.3	13.3	107	2.81	8.42	0.0	18	8	5	2	2	0	0	13	104	1520	20	1100	1160	16669
02-19-88	18147	121.2	10.6	58	6.85	5.16	0.0	45	21	8	7	5	0	0	22	44	1630	30	1010	1300	17509

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2086 ENGINE TYPE: V-6 CHEV S-10 FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
05-15-85	44	34.6	8.0	214	1.79	5.72	4.7	74	58	16	11	3	41	6	488	1	19	1982	917	1065	14191
08-13-85	3359	61.4	9.5	136	2.38	2.24	1.7	122	129	19	27	6	49	8	485	16	357	1476	1110	1194	14561
OIL CHANGE AT 3359 MILES																					
09-09-85	4801	86.6	11.8	135	2.35	3.81	1.2	49	55	8	8	6	10	2	116	64	531	1590	1308	1498	14603
CONVERTED TO METHANOL AT 4801 MILES and B of A Oil Added																					
New Unused B of A Oil		137.4	14.4	103	3.01	10.61		1	<1	<1	<1	1	<1	<1	20	282	1903	6	1345	1263	14740
11-27-85	4828	124.8	13.4	102	2.52	6.74	.5	25	13	13	3	4	2	1	37	2	1124	108	1214	1176	14740
03-17-86	6096	126.5	13.2	99	2.64	3.45	0.0	133	534	25	55	8	9	4	51	3	998	231	1145	1006	14979
OIL CHANGE AT 6415 MILES																					
05-02-86	7698	132.6	14.2	105	2.82	7.03	0.0	65	90	11	13	4	2	1	2	22	1021	62	1415	1358	15131
06-11-86	8705	136.1	14.5	106	6.00	6.68	.1	73	102	14	14	9	3	13	42	4	1430	48	1160	1148	15191
08-07-86	9770	138.6	14.4	102	7.52	5.50	0.0	122	187	17	16	13	7	0	45	1	1098	50	1360	1308	15343
OIL CHANGE AT 9770 MILES																					
09-23-86	11049	129.7	14.2	108	3.93	7.86	0.0	57	68	20	13	7	3	0	24	12	1620	30	1290	1308	15461
11-14-86	12316	139.8	14.6	104	4.60	5.61	0.0	103	108	19	12	12	5	0	27	3	1860	30	1370	1190	15556
01-29-87	13380	142.9	15.7	114	7.46	4.26	0.0	192	253	25	17	15	10	0	33	2	1620	50	1548	1198	15831
OIL CHANGE AT 13381 MILES																					
04-17-87	14462	128.2	13.4	99	3.09	8.87	0.0	56	53	14	3	6	2	0	18	14	1790	30	1550	1230	16032
07-13-87	15514	127.2	13.2	97	6.40	5 95	0.0	111	70	16	5	13	5	0	20	2	1800	0	1410	1160	16432
OIL CHANGE AT 15515 MILES																					
10-24-87	16581	136.2	15.0	112	3.93	8.75	0.0	46	26	11	3	6	1	0	13	16	2190	50	1410	1160	16759

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2007 ENGINE TYPE: V-6 CHEV S-10 FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
05-15-85	41	46.4	8.8	172	2.10	2.58	2.4	55	31	22	14	3	28	5	351	<1	11	906	910	986	14197
09-09-85	2329	48.5	8.3	145	2.82	.35	.8	157	125	36	41	8	93	14	1060	<1	16	1400	1090	1103	14606
OIL CHANGE AT 2329 MILES																					
10-03-85	4063	80.6	11.2	128	2.18	4.15	1.0	27	19	<1	4	1	9	1	131	60	960	317	1032	1244	14640
12-13-85	5293	78.0	10.9	127	3.53	3.05	1.5	34	29	89	9	3	9	1	155	43	933	261	970	1125	14815
CONVERTED TO METHANOL AT 5490 MILES and B of A Oil Added																					
New Unused B of A Oil		137.4	14.4	103	3.01	10.61		1	<1	<1	<1	1	<1	<1	20	202	1903	6	1345	1263	14740
01-08-86	5491	85.1	11.0	131	2.34	5.58	1.5	8	3	93	2	1	1	<1	25	116	930	23	852	933	14858
05-22-86	6737	124.1	14.1	112	3.76	6.73	0.0	75	196	25	30	7	2	0	45	7	1570	220	1290	1160	15163
07-01-86	7082	125.6	13.5	103	7.29	5.05	0.0	88	192	26	34	10	3	0	50	5	1070	200	1070	1110	15214
08-28-86	7740	113.1	13.1	111	6.11	5.11	0.0	117	229	27	35	11	3	0	53	2	1100	360	1090	1350	15402
11-06-86	9050	126.9	14.2	111	4.94	3.82	0.0	298	311	30	41	17	5	0	60	1	1100	360	1340	1250	15520
12-18-86	10462	144.6	15.9	115	7.52	2.24	0.0	298	311	30	41	17	5	0	60	1	1100	360	1340	1250	15710
01-23-87	11604	158.5	17.1	116	8.02	4.04	0.0	331	299	32	42	17	6	0	60	5	1250	310	1300	1210	15829
OIL CHANGE AT 11605 MILES																					
03-13-87	13618	127.0	13.0	95	4.66	6.40	0.0	54	53	12	8	7	2	0	18	5	1310	200	1090	1150	15985
05-05-87	14789	131.4	19.2	166	3.14	5.50	0.0	134	83	17	39	12	3	0	27	3	1620	220	1370	1180	16071
OIL CHANGE AT 14790 MILES																					
06-01-87	15796	131.8	14.5	109	4.71	7.74	0.0	53	53	9	12	6	1	0	17	32	2160	50	1460	1270	16210
OIL CHANGE AT 17000 MILES																					
07-07-87	17020	130.6	13.9	103	4.49	5.84	0.0	73	34	12	8	9	3	0	21	4	1420	170	1230	1230	16414
07-08-87	17035	126.0	14.2	112	4.71	6.21	0.0	67	31	10	7	8	2	0	17	3	1350	150	1150	1120	16416
08-26-87	18389	123.2	15.0	125	5.84	5.16	0.0	95	42	12	9	11	3	0	22	2	1290	310	1240	1240	16577
OIL CHANGE AT 18389 MILES																					
10-24-87	19608	146.2	14.3	95	4.15	8.03	0.0	42	21	9	5	5	0	0	15	15	2130	80	1420	1160	16760

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2888 ENGINE TYPE: V-6 CHEV S-10 FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
05-15-85	29	47.4	8.8	167	1.97	3.70	2.6	60	35	18	11	1	32	3	385	<1	6	898	992	1081	14198
07-29-85	3395	55.6	8.6	157	3.10	1.83	1.4	143	115	30	24	7	153	10	756	4	371	1050	1102	1248	14457
HAD ACCIDENT AT 3395 MILES																					
09-30-85	4786	110.6	14.2	129	.99	3.29	.8	20	19	14	10	1	5	1	84	6	426	698	953	1008	14638
CONVERTED TO METHANOL AT 4786 MILES and B of A Oil Added																					
New Unused B of A Oil		137.4	14.4	103	3.01	10.61		1	<1	<1	<1	1	<1	<1	20	282	1963	6	1345	1263	14748
11-27-85	4788	133.2	13.9	101	2.34	6.63	.3	13	<1	12	<1	2	1	<1	33	215	1025	86	1127	1055	14744
01-28-86	5888	136.0	12.8	84	2.34	3.51	0.0	61	701	20	73	5	9	2	82	9	1122	123	1223	1196	14875
04-24-86	7248	138.3	13.9	96	3.30	2.94	.1	84	594	18	69	5	5	4	92	9	1218	98	1189	1192	15858
05-29-86	8272	125.1	15.2	126	5.33	5.11	.1	184	531	24	81	13	9	0	97	4	1268	158	1388	1238	15164
07-02-86	9781	148.6	14.8	99	5.61	3.14	.1	92	486	22	72	15	9	0	82	4	888	128	1818	1898	15216
07-31-86	18985	112.7	16.7	161	5.72	3.48	0.0	116	481	23	73	15	9	0	98	15	1228	338	1238	1438	15327
OIL CHANGE AT 18986 MILES																					
09-03-86	11968	131.1	14.2	187	3.31	7.57	0.0	42	189	15	15	8	2	0	33	12	1778	68	1298	1438	15486
18-89-86	13269	132.2	15.5	122	4.38	6.17	0.0	39	84	13	15	5	3	0	32	3	1128	58	928	1238	15587
11-17-86	14387	128.6	13.2	96	3.93	7.52	0.0	65	111	24	16	8	9	0	35	38	2818	88	1468	1238	15557
OIL CHANGE AT 15488 MILES																					
03-05-87	16659	136.1	16.4	129	3.48	7.41	0.0	52	34	10	4	6	1	0	23	14	1458	88	1288	1148	15918
05-14-87	17978	142.8	14.8	183	5.58	6.17	0.0	131	58	13	13	11	3	0	29	17	2138	98	1698	1468	16182
OIL CHANGE AT 17978 MILES																					
07-13-87	18957	125.3	17.3	152	3.82	6.96	0.0	62	17	8	3	6	2	0	17	7	1688	28	1378	1188	16433
07-28-87	19884	128.3	14.2	189	5.72	7.29	0.0	67	18	9	8	7	3	8	22	6	1668	28	1878	1288	16454
08-25-87	28647	138.6	15.1	111	6.51	4.84	0.0	162	49	12	7	11	6	0	28	4	1768	48	1398	1378	16572
18-24-87	22864	154.8	16.8	187	6.86	6.62	0.0	172	61	12	8	18	5	0	23	13	2838	58	1578	1318	16757
OIL CHANGE AT 22111 MILES																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2889 ENGINE TYPE: V-6 CHEV S-10 FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
05-15-85	140	49.0	9.0	160	1.76	4.26	2.6	73	37	22	18	3	36	6	439	<1	12	1167	875	998	14192
08-14-85	3072	51.7	8.6	145	2.37	1.17	1.2	161	151	25	42	6	159	11	715	1	9	1401	955	1033	14564
OIL CHANGE AT 3072 MILES																					
09-18-85	4261	92.8	11.6	132	2.34	3.83	1.1	37	22	11	4	2	20	1	128	51	505	1960	1150	1302	14624
10-21-85	5520	81.3	11.6	134	2.82	2.69	1.3	46	34	11	12	4	9	2	139	25	464	1570	1250	1306	14703
11-08-85	6400	87.3	11.9	129	3.31	2.63	1.1	59	50	11	16	6	5	2	150	15	478	1610	1163	1342	14729
OIL CHANGE AT 6400 MILES																					
12-02-85	6564	85.2	12.0	134	2.08	4.56	1.5	12	1	78	<1	2	1	<1	28	136	881	192	893	967	14745
CONVERTED TO METHANOL AT 6564 MILES and B of A Oil Added																					
New Unused B of A Oil		137.4	14.4	103	3.01	10.61		1	<1	<1	<1	1	<1	<1	20	282	1903	6	1345	1263	14748
02-19-86	7655	129.9	13.5	99	2.88	5.10	0.0	71	406	26	47	5	4	3	49	17	1101	90	1221	1157	14912
04-23-86	9510	128.2	13.8	94	2.78	2.80	.8	121	267	26	41	4	4	.5	51	15	611	1370	1106	1118	15059
07-31-86	10596	123.7	13.3	102	3.98	4.15	0.0	343	574	48	94	18	16	0	85	20	1170	410	1230	1590	15320
10-09-86	11682	141.6	14.2	97	4.54	2.69	0.0	460	588	61	92	20	18	0	90	9	990	360	1320	1550	15472
10-14-86	11701	130.8	14.8	114	3.70	2.47	0.0	397	510	52	79	19	17	0	74	7	790	320	900	1430	15510
12-15-86	12874	139.9	13.8	94	4.66	3.37	0.0	695	780	67	97	26	19	0	87	19	900	330	1260	1450	15704
OIL CHANGE AT 12874 MILES																					
03-05-87	13830	132.6	17.4	144	3.25	6.51	0.0	120	129	43	17	6	4	0	27	13	1460	40	1250	1170	15911
05-07-87	14937	139.1	14.6	104	4.04	5.16	0.0	198	171	59	23	13	7	0	32	10	1400	60	1200	1360	16075
OIL CHANGE AT 14938 MILES																					
07-13-87	16005	122.4	13.8	110	5.05	7.18	0.0	77	43	47	9	8	3	0	18	11	1700	30	1370	1270	16431
07-15-87	16026	121.6	14.3	118	5.16	6.96	0.0	67	38	43	4	7	3	0	19	10	1640	30	1140	1240	16451
07-31-87	16649	126.1	13.5	102	6.17	4.71	0.0	121	128	37	11	11	16	0	35	0	1210	280	1120	1160	16468
09-08-87	16941	128.4	14.5	113	5.16	5.39	0.0	106	28	20	6	8	2	0	17	5	1320	40	1200	1070	16672
02-04-88	17431	127.3	14.3	112	4.60	5.16	0.0	291	87	62	23	16	7	0	36	7	1350	150	1350	1440	17510

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2090 ENGINE TYPE: L-4 CHEV S-10 FT. ORD BASELINE VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
06-06-85	262	49.5	8.7	154	1.63	4.15	1.6	62	54	17	20	2	11	5	276	6	53	1030	1036	1106	14267
08-30-85	3425	63.7	9.9	140	2.70	2.00	1.3	115	150	26	39	5	100	9	290	21	191	1540	1171	1316	14589
OIL CHANGE AT 3425 MILES																					
10-03-85	4711	89.6	12.4	134	2.81	4.04	1.0	37	42	88	9	3	6	1	65	62	496	1640	1276	1153	14641
11-15-85	6189	95.2	12.6	127	3.79	2.55	1.1	61	85	21	17	6	5	3	92	33	529	1800	1249	1493	14730
12-09-85	6930	100.0	13.1	128	4.31	2.48	1.2	81	120	25	24	21	7	3	103	25	511	1600	1247	1491	14809
12-17-85	7130	96.6	12.6	125	4.72	2.80	1.3	87	135	28	27	10	9	3	113	26	532	1730	1304	1622	14818
8384-8417 MILES,BFLRF COLD START TEST																					
03-24-86	8385	83.3	11.4	127	3.21	2.62	2.4	25	46	88	6	1	11	1	44	77	953	220	805	1031	15031
07-31-86	8386	80.9	11.0	124	2.02	5.72	5.0	38	47	21	9	2	1	0	25	71	1410	60	990	1298	15353
OIL CHANGE AT 8418 MILES																					
12-11-86	9543	118.9	13.9	115	3.31	7.97	0.0	19	33	16	10	3	0	0	25	141	1450	50	1350	1210	15695
OIL CHANGE AT 11035 MILES																					
05-07-87	11836	124.2	14.3	115	4.04	5.50	0.0	27	323	22	47	3	1	0	37	39	1610	270	1240	1250	16072
07-21-87	14236	148.5	15.2	103	7.07	6.96	0.0	28	128	10	16	5	3	0	26	69	2040	40	980	1290	16455
08-25-87	15438	156.4	16.3	109	6.51	6.51	0.0	30	142	12	20	5	3	0	30	72	1900	40	1200	1350	16573
OIL CHANGE AT 15439 MILES																					
03-22-88	18725	141.3	15.5	113	6.06	6.40	0.0	24	550	10	83	2	2	0	23	59	1860	30	1100	1390	17511

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2091 ENGINE TYPE: V-6 CHEV S-10 FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
05-15-85	26	46.7	8.3	153	2.07	2.13	2.5	50	29	24	14	26	26	3	353	<1	7	930	909	1060	14199
08-29-85	3224	51.3	8.5	142	4.18	.22	1.5	200	132	38	49	33	340	15	990	1	20	1460	1126	1194	14587
OIL CHANGE AT 3224 MILES																					
09-30-85	4081	84.0	11.8	132	7.15	3.16	.9	37	23	11	8	8	9	2	167	41	504	1620	1261	1415	14637
CONVERTED TO METHANOL AT 4081 MILES and 8 of A Oil Added																					
New Unused 8 of A Oil		137.4	14.4	103	3.01	10.61		1	<1	<1	<1	1	<1	<1	20	282	1903	6	1345	1263	14740
03-14-86	6214	125.3	13.0	97	2.96	3.77	.3	41	369	21	36	5	6	2	81	14	1106	100	1140	1159	14974
03-25-86	6696	134.5	13.0	98	2.60	2.96	0.0	55	421	20	36	7	1	2	87	2	1150	76	1261	1202	15016
06-06-86	7592	135.5	14.4	105	5.22	3.98	.2	107	313	24	40	15	3	0	73	2	780	190	840	1060	15100
07-17-86	8889	130.0	16.0	122	6.17	2.58	0.0	163	358	28	47	15	3	0	90	3	930	170	1410	1000	15312
08-22-86	10137	154.3	16.3	111	7.07	1.96	0.0	266	361	33	54	19	5	0	86	3	1030	210	1070	1440	15398
09-24-86	11390	163.8	15.6	97	8.87	1.35	0.0	340	400	38	54	19	5	0	88	5	1240	230	1200	1520	15463
OIL CHANGE AT 11391 MILES																					
10-31-86	12774	132.7	14.8	113	4.94	6.28	0.0	67	92	21	19	7	2	0	32	6	1010	50	940	1300	15513
12-11-86	14101	114.9	12.9	106	2.97	8.87	0.0	43	33	8	7	7	0	0	15	52	1400	510	1360	1230	15696
OIL CHANGE AT 15281 MILES																					
02-24-87	16857	143.8	15.4	110	5.16	7.07	0.0	88	32	17	7	11	2	0	24	7	2140	120	1630	1360	15895
04-02-87	18129	144.0	14.4	98	3.87	5.72	0.0	111	30	16	7	10	4	0	24	20	1710	100	1730	1310	16020
05-27-87	20126	161.0	16.2	105	4.71	5.05	0.0	191	64	18	13	13	6	0	21	2	1290	50	1470	1230	16144
OIL CHANGE AT 20127 MILES																					
07-07-87	21330	140.2	14.7	104	5.27	6.17	0.0	69	31	17	0	7	2	0	19	0	1700	40	1320	1310	16415
08-27-87	22707	154.3	15.5	102	5.72	6.06	0.0	85	31	17	3	9	4	0	19	10	1590	40	1310	1170	16666
10-15-87	24760	140.3	14.7	104	7.86	3.59	0.0	167	68	39	12	12	8	0	28	3	2270	60	1260	1460	16805

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

REVISION DATE: AUG 11, 1988

VEHICLE USA #: CM2892 ENGINE TYPE: V-6 CHEV S-10 FT. ORD METHANOL VEHICLE

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
05-15-85	16	46.0	8.9	175	2.21	4.60	2.5	54	53	13	15	1	30	3	362	<1	8	1015	1034	1143	14194
08-13-85	3214	47.3	8.2	147	3.15	.78	1.6	147	231	23	44	6	83	0	749	<1	12	1502	1127	1187	14562
OIL CHANGE AT 3214 MILES																					
09-18-85	3973	81.5	11.5	131	2.10	2.71	1.1	26	26	8	7	3	10	1	117	75	523	1960	1170	1371	14623
10-22-85	5438	81.0	11.5	132	2.08	2.96	1.3	32	37	8	11	4	7	1	120	50	402	1500	1202	1393	14704
12-02-85	6566	84.4	11.8	131	3.44	2.57	1.4	43	50	10	13	8	7	1	150	49	400	912	1273	1436	14741
CONVERTED TO METHANOL AT 6566 MILES and B of A Oil Added																					
New Unused B of A Oil		137.4	14.4	103	3.01	10.61		1	<1	<1	<1	1	<1	<1	20	282	1903	6	1345	1263	14748
02-19-86	7510	129.7	13.6	100	2.96	4.31	0.0	34	461	19	51	5	3	2	47	12	1002	200	1251	1221	14913
03-24-86	0033	130.0	13.2	95	2.65	3.20	1.0	66	453	21	57	7	13	2	53	7	967	202	1058	1042	15079
8034-8059 MILES, BFLRF COLD START TEST																					
OIL CHANGE AT 8038 MILES																					
12-01-86	9223	131.4	14.7	113	3.48	7.97	0.6	65	110	14	10	6	1	0	15	19	1560	40	1298	1188	15606
01-23-87	10304	148.7	15.6	108	6.79	5.05	0.0	189	146	21	20	13	5	0	34	4	1770	70	1620	1268	15830
OIL CHANGE AT 10305 MILES																					
04-02-87	12429	143.9	16.2	119	6.85	5.39	0.0	101	38	12	6	10	4	0	16	3	1760	20	1130	1208	15998
05-18-87	13744	151.1	15.3	101	5.95	5.39	0.0	201	62	16	13	15	6	0	22	3	2110	40	1608	1268	16099
07-07-87	15201	170.9	16.5	101	8.08	5.72	0.0	342	111	22	20	17	13	0	27	2	1750	40	1310	1328	16429
OIL CHANGE AT 15201 MILES																					
08-25-87	16580	151.1	16.1	111	6.85	7.18	0.0	93	29	17	10	9	5	0	18	11	2170	30	1330	1260	16575

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2892 ENGINE TYPE: V-6 CHEV S-10 FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
10-15-87	17912	167.3	16.4	102	7.41	5.05	0.0	206	38	19	18	12	10	0	25	4	2410	50	1200	1350	16006

OIL CHANGE AT 19290 MILES

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2093 ENGINE TYPE: V-6 CHEV S-10 FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	DFLRF CODE
05-15-85	1218	30.2	7.9	185	2.07	5.05	2.7	162	58	28	22	7	59	9	660	2	38	2191	988	1024	14196
07-25-85	3373	48.5	9.2	174	3.07	1.88	1.4	238	126	33	25	13	176	12	880	<1	30	2291	1074	1156	14456
OIL CHANGE AT 3373 MILES																					
09-03-85	4258	77.5	11.0	131	2.40	4.06	1.3	46	25	94	6	2	30	1	100	72	947	260	1084	1132	14585
09-09-85	4591	80.8	11.3	130	2.59	3.23	1.0	48	29	95	10	2	11	2	119	6	944	332	998	1138	14605
CONVERTED TO METHANOL AT 4591 MILES and B of A Oil Added																					
New Unused B of A Oil		137.4	14.4	103	3.01	10.61		1	<1	<1	<1	1	<1	<1	20	202	1983	6	1345	1263	14748
11-27-85	4592	131.7	13.9	102	2.49	6.72	.5	13	<1	19	<1	2	1	1	29	231	1093	48	1133	1061	14746
03-04-86	5964	132.5	13.3	94	2.90	2.03	0.0	72	616	30	65	5	10	2	42	22	1151	76	1284	1170	14876
05-12-86	7265	131.7	13.8	101	4.00	2.80	.5	131	760	29	81	8	10	5	53	4	1212	119	1190	1246	15143
07-02-86	8244	120.4	13.2	104	5.55	3.76	0.0	131	370	34	59	12	8	0	43	2	1088	348	1298	1090	15227
09-11-86	9376	127.8	14.5	114	6.28	5.27	0.0	117	297	53	51	13	17	0	41	5	1398	218	1198	1458	15425
11-03-86	10509	124.1	13.2	100	3.93	2.69	0.0	108	104	24	39	8	7	0	26	1	270	28	788	848	15527
OIL CHANGE AT 10509 MILES																					
12-11-86	11942	144.8	14.8	102	4.43	6.62	0.0	67	102	21	18	9	3	0	18	17	1498	78	1378	1288	15699
03-02-87	13288	148.1	18.8	144	6.73	4.83	0.0	105	105	21	16	13	6	0	21	4	1588	68	1438	1188	15897
05-18-87	14552	141.2	14.6	103	5.33	4.71	0.0	183	112	22	16	18	6	0	24	4	1698	388	1558	1368	16188
OIL CHANGE AT 14581 MILES																					
07-24-87	15788	128.1	14.2	110	5.16	7.18	0.0	53	27	10	0	4	3	0	15	11	2058	58	1178	1268	16456
OIL CHANGE AT 17518 MILES																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2894 ENGINE TYPE: L-4 CHEV S-10 FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
06-05-85	470	40.1	8.5	154	1.69	5.27	1.7	44	41	57	21	1	11	5	262	55	473	832	1005	1154	14266
08-20-85	3040	52.8	7.9	116	3.65	2.01	1.4	78	122	61	37	3	120	0	370	19	514	1058	1028	1285	14594
OIL CHANGE AT 3040 MILES																					
10-02-85	4348	82.8	11.7	134	2.91	3.80	.9	20	36	11	7	<1	6	1	72	65	567	1560	1292	1434	14642
12-04-85	6945	86.3	11.7	127	3.89	2.72	1.4	27	71	39	13	3	4	1	70	33	611	1260	1119	1354	14807
OIL CHANGE AT 6994 MILES																					
01-14-86	7995	87.0	11.9	129	2.78	2.47	1.1	16	29	92	9	1	3	<1	33	100	997	321	996	1125	14877
01-20-86	8007	92.5	12.2	124	3.44	2.36	.8	20	39	85	11	3	3	1	30	83	1319	343	1034	1158	14878
CONVERTED TO METHANOL AT 9797 MILES and B of A Oil Added																					
New Unused B of A Oil		137.4	14.4	103	3.01	10.61		1	<1	<1	<1	1	<1	<1	20	202	1903	6	1345	1263	14748
9890-10018 MILES, BFLRF COLD START TEST																					
03-24-86	9897	130.6	14.4	110	2.78	6.96	.2	12	9	13	1	1	4	<1	17	156	1456	17	1154	1188	15029
10-06-86	10025	121.5	13.7	110	2.24	8.19	0.0	31	15	7	5	2	1	0	14	133	1190	30	1230	1210	13471
12-11-86	11251	123.4	17.3	154	3.37	4.83	0.0	117	76	32	11	7	10	0	23	12	910	50	1400	1110	15697
02-13-87	12546	141.6	14.9	106	5.67	3.93	0.0	156	108	45	17	8	18	0	33	6	1100	50	1290	1070	15861
04-14-87	13644	145.2	15.0	104	1.46	4.71	0.0	233	161	51	27	11	26	0	40	6	1430	50	1530	1200	16029
OIL CHANGE AT 13645 MILES																					
06-16-87	14847	132.9	14.1	104	5.72	7.52	0.0	71	80	43	11	5	10	0	24	19	1770	20	1350	1238	16221
08-14-87	16009	113.3	13.5	116	5.16	6.28	0.0	105	112	56	18	8	14	0	28	3	1770	40	1270	1310	16571
10-14-87	16530	121.0	13.8	101	7.29	4.94	0.0	178	145	60	31	9	21	0	42	3	2040	50	1320	1360	16802
OIL CHANGE AT 17529 MILES																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2095 ENGINE TYPE: V-6 CHEV S-10 FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
05-15-85	121	42.4	9.0	200	2.16	6.96	1.6	53	54	22	15	15	37	6	515	1	15	2232	852	1026	14280
09-03-85	1705	49.4	9.1	167	2.60	2.68	1.8	116	125	25	25	18	220	9	650	20	136	2140	1158	1247	14586
OIL CHANGE AT 1705 MILES																					
10-02-85	2990	82.7	11.8	136	2.78	3.56	.8	36	26	8	6	5	10	2	120	66	489	1690	1305	1513	14644
11-12-85	4794	83.5	11.6	130	4.08	2.77	1.4	63	50	9	12	10	8	2	140	30	519	1670	1342	1527	14817
OIL CHANGE AT 4794 MILES																					
02-19-86	6134	85.9	11.5	125	3.61	2.12	1.4	32	16	94	3	3	3	1	37	73	1010	215	957	1126	14929
03-07-86	6475	84.0	11.5	128	3.80	2.62	1.9	40	24	76	5	4	1	1	35	48	943	100	932	1000	14958
CONVERTED TO METHANOL AT 6475 MILES and B of A Oil Added																					
New Unused B of A Oil		137.4	14.4	103	3.01	10.61		1	<1	<1	<1	1	<1	<1	20	202	1903	6	1345	1263	14749
05-19-86	7304	131.2	14.1	105	3.70	8.41	0.0	90	73	28	12	13	4	0	28	45	2090	90	1400	1400	15165
08-22-86	10186	140.6	15.0	108	6.68	4.38	0.0	104	210	30	35	18	11	0	23	3	1490	70	1260	1390	15399
09-24-86	11354	151.0	16.1	112	8.08	4.15	0.0	105	191	29	33	16	12	0	22	3	1410	70	1220	1290	15462
OIL CHANGE AT 11355 MILES																					
10-02-86	12402	137.9	16.8	132	3.14	1.52	0.0	32	57	15	13	6	3	0	15	13	1140	40	980	1250	15508
12-11-86	13604	140.5	14.7	104	5.39	6.40	0.0	62	73	18	19	12	5	0	19	6	1540	50	1500	1200	15698
OIL CHANGE AT 14921 MILES																					
03-05-87	16273	141.1	13.8	93	6.28	6.62	0.0	115	32	65	12	10	2	0	20	4	1760	20	1270	1148	15912
04-02-87	17571	135.5	15.8	122	3.93	5.27	0.0	124	46	53	9	15	3	0	14	2	1490	30	1150	12[illegible]	15999
05-12-87	19310	151.2	16.4	115	3.93	5.72	0.0	199	96	68	10	15	5	0	16	11	1830	40	1410	12[illegible]	16079
OIL CHANGE AT 19311 MILES																					
06-16-87	21025	138.5	16.5	128	6.00	5.84	0.0	69	31	38	7	9	2	0	11	1	1690	30	1310	1240	16222

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2895 ENGINE TYPE: V-6 CHEV S-10 FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	100 C	VI	TAN	TBN D664	FUEL OIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
07-14-87	22243	140.3	16.0	129	3.14	6.28	0.0	79	34	26	9	11	3	0	10	46	1220	30	1370	970	16448
10-24-87	23319	104.9	12.8	117	3.37	2.92	0.0	312	103	103	11	14	5	0	16	0	1180	40	1350	1190	16758
02-16-88	24261	95.8	12.1	119	6.40	4.38	0.0	498	221	43	22	19	9	0	25	0	1250	30	1060	1290	17512

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2896 ENGINE TYPE: L-4 CHEV S-10 FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
06-05-85	151	47.9	8.5	155	2.12	5.39	1.8	30	20	59	16	1	11	4	270	62	542	770	1076	1217	14263
08-29-85	2869	51.6	8.8	148	3.38	2.34	1.6	72	95	65	36	3	120	7	370	24	596	950	1040	1231	14590
OIL CHANGE AT 2869 MILES																					
11-08-85	6109	98.7	12.3	133	3.63	2.88	.9	26	43	24	12	2	3	1	92	44	575	1640	1265	1497	14720
OIL CHANGE AT 6109 MILES																					
12-13-85	7267	72.8	10.2	123	2.53	3.52	1.0	55	17	85	7	4	2	<1	25	93	1072	171	1033	1155	14816
CONVERTED TO METHANOL AT 8622 MILES and B of A Oil Added																					
New Unused B of A Oil		137.4	14.4	103	3.01	10.61		1	<1	<1	<1	1	<1	<1	20	282	1903	6	1345	1263	14748
02-19-86	8623	89.7	11.8	123	3.38	2.88	1.0	16	40	88	7	1	2	1	29	73	980	170	974	1087	14914
03-26-86	9150	128.0	13.5	100	2.93	6.21	0.0	44	237	33	24	3	3	0	29	128	1735	77	1302	1256	15017
05-19-86	10105	127.6	13.9	106	7.70	6.45	0.0	75	261	48	44	6	10	0	29	15	1428	118	1188	1188	15166
08-22-86	11358	138.1	15.5	116	7.85	5.67	0.0	123	271	49	47	12	17	0	46	4	1418	138	1278	1488	15488
11-25-86	12624	123.7	13.7	107	4.94	6.17	0.0	145	261	45	26	13	16	0	40	2	1688	638	1278	1278	15688
OIL CHANGE AT 13404 MILES																					
03-05-87	13405	131.8	14.8	104	4.38	7.97	0.0	55	72	23	12	3	5	0	28	31	1428	78	1218	1868	15914
OIL CHANGE AT 14525 MILES																					
06-23-87	14535	103.4	11.7	101	3.78	6.48	0.0	39	24	15	8	4	3	0	19	18	1168	448	1178	1288	16247
10-21-87	15569	143.6	14.7	101	5.85	7.87	0.0	48	34	18	9	3	4	0	17	26	2888	88	1458	1188	16754

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2097 ENGINE TYPE: V-6 CHEV S-10 FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL OIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
05-15-85	34	37.3	8.3	207	1.90	6.26	4.3	41	33	11	8	3	32	4	451	1	16	2131	868	1012	14202
08-29-85	2333	45.3	8.6	171	3.09	2.10	1.7	164	111	22	39	10	310	10	900	<1	21	2350	1070	1150	14503
OIL CHANGE AT 2333 MILES																					
10-30-85	3496	70.1	11.2	134	2.81	2.65	1.6	32	16	6	9	3	3	1	110	48	383	1620	1114	1140	14710
01-07-86	4760	84.8	11.5	127	4.53	2.46	1.4	74	49	10	13	0	4	2	159	28	490	1660	1270	1393	14851
OIL CHANGE AT 4760 MILES																					
01-29-86	5751	82.9	11.6	131	2.82	2.57	1.4	20	11	95	5	2	2	<1	34	106	1027	190	971	1076	14879
02-27-86	6960	84.7	11.5	126	3.51	2.19	1.9	28	14	79	5	3	2	<1	40	56	966	170	934	1089	14915
03-14-86	7576	87.1	11.7	125	4.46	2.33	0.0	35	23	04	6	3	3	<1	43	38	1002	190	877	993	14973
CONVERTED TO METHANOL AT 7576 MILES and B of A Oil Added																					
New Unused B of A Oil		137.4	14.4	103	3.01	10.61		1	<1	<1	<1	1	1	<1	20	282	1903	6	1345	1263	14748
05-15-86	8288	130.0	13.5	99	4.77	8.13	0.0	54	235	30	30	6	3	0	26	57	1850	70	1350	1270	15167
07-03-86	9670	133.5	18.4	159	4.21	5.83	0.0	66	244	29	33	12	6	0	28	5	1400	60	1400	1110	15229
07-22-86	10500	137.2	14.5	105	5.89	6.11	0.0	76	290	32	41	13	9	0	30	27	1660	70	1340	1440	15326
08-29-86	11826	147.0	15.5	107	6.90	4.94	0.0	101	291	35	44	15	11	0	31	3	1680	70	1300	1450	15403
OIL CHANGE AT 11826 MILES																					
10-02-86	13019	140.1	15.2	111	4.21	7.97	0.0	40	88	19	13	6	2	0	21	27	1790	50	1430	1500	15469
11-06-86	14273	138.9	15.4	113	5.39	6.85	0.0	41	57	13	14	7	4	0	14	4	1230	30	1050	1080	15529
12-12-86	15427	148.3	14.8	99	4.66	4.94	0.0	98	118	19	20	12	10	0	20	6	1550	70	1480	1220	15701
OIL CHANGE AT 15427 MILES																					
04-02-87	18141	145.8	14.8	101	6.28	5.39	0.0	88	76	14	9	13	11	0	17	1	1450	20	1140	1240	16000
05-14-87	19510	166.8	19.3	132	7.07	4.26	0.0	202	127	18	16	17	13	0	22	2	2110	50	1620	1340	16098
OIL CHANGE AT 19511 MILES																					
06-24-87	20980	121.9	14.4	119	3.03	7.41	0.0	59	34	12	7	9	4	0	12	4	1420	30	1240	1120	16426

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2097 ENGINE TYPE: V-6 CHEV S-10 FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
08-05-87	22210	131.5	21.5	191	5.27	4.15	0.0	103	103	12	9	11	4	0	14	2	1190	140	1240	1150	16520
10-14-87	23636	145.1	14.5	90	5.61	3.59	0.0	218	84	16	11	15	7	0	24	1	1540	310	1300	1440	16803

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2090 ENGINE TYPE: V-6 CHEV S-10 FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
05-15-85	106	37.0	8.2	204	2.04	6.28	3.4	48	36	13	13	4	41	7	546	1	21	2225	810	1009	14201
06-20-85	3017	52.9	9.5	167	2.95	4.04	1.2	155	124	23	41	12	44	16	857	8	23	2605	1100	1354	14367
OIL CHANGE AT 3017 MILES																					
08-30-85	5499	108.5	13.9	129	2.19	2.17	.8	68	32	10	9	6	40	2	130	2	389	930	999	1105	14570
OIL CHANGE AT 5499 MILES																					
CONVERTED TO METHANOL AT 5686 MILES and B of A Oil Added																					
New Unused B of A Oil		137.4	14.4	103	3.01	10.61		1	<1	<1	<1	1	<1	<1	20	282	1963	6	1345	1263	14740
09-09-85	5687	86.9	12.1	134	2.23	4.89	1.2	20	7	3	3	2	2	1	33	72	486	1448	1235	1358	14602
11-27-85	5807	121.4	13.1	102	2.04	5.78	.9	97	19	17	8	6	2	3	32	173	1056	167	1218	1144	14739
02-27-86	6895	120.2	13.5	100	2.86	3.78	0.0	124	370	22	51	10	2	5	43	17	1205	158	1274	1239	14916
04-24-86	8348	141.8	14.2	97	3.96	2.47	0.0	196	442	26	60	13	9	7	79	4	1177	1318	1244	1236	15118
06-11-86	9460	142.5	14.4	99	6.17	3.70	0.0	193	347	30	59	18	11	19	67	3	1158	138	1268	1268	15193
OIL CHANGE AT 11160 MILES																					
08-22-86	11161	132.3	14.3	107	3.25	8.70	0.0	41	76	14	11	6	2	0	22	75	1648	48	1288	1398	15401
10-19-86	12177	130.6	14.5	111	3.93	7.97	0.0	31	36	11	9	3	1	0	15	17	1138	48	918	1198	15511
12-10-86	13323	142.5	14.5	108	5.84	5.27	0.0	92	56	13	9	11	3	0	27	3	1988	58	1628	1298	15711
03-06-87	14425	154.1	14.2	88	6.28	4.49	0.0	178	68	13	13	9	18	0	38	2	1428	48	1318	1148	15916
05-19-87	15614	157.7	15.7	102	2.69	5.58	0.0	278	99	16	17	14	18	0	29	14	2818	68	1648	1398	16101
OIL CHANGE AT 15615 MILES																					
07-17-87	16816	134.9	13.8	98	6.86	7.52	0.0	49	18	8	8	5	3	8	15	6	1698	18	1078	1168	16453
10-24-87	17893	147.3	14.1	92	8.38	5.72	0.0	118	29	12	9	9	4	8	21	3	2188	48	1628	1328	16756

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2899 ENGINE TYPE: L-4 CHEV S-10 FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
06-05-85	1079	50.5	8.7	152	2.06	4.60	1.2	66	45	23	23	3	11	5	284	12	134	1390	1040	1227	14269
07-24-85	4702	74.5	9.9	113	3.42	3.51	1.4	52	72	16	20	2	8	4	157	21	607	897	932	1031	14466
OIL CHANGE AT 5038 MILES																					
09-03-85	5405	82.5	11.7	134	2.21	4.95	1.6	14	15	84	3	<1	10	<1	40	90	1030	130	1020	1100	14593
TRANSFERRED TO JPL																					
CONVERTED TO METHANOL AT 7892 MILES and B of A Oil Added																					
New Unused B of A Oil		137.4	14.4	103	3.01	10.61		1	<1	<1	<1	1	<1	<1	20	282	1903	6	1345	1263	14748
OIL CHANGE AT 7893 MILES																					
RETURNED TO FOCA ON 9-11-86																					
09-08-86	7904	128.9	14.1	107	2.75	4.88	0.0	124	403	43	55	19	15	0	50	18	1140	70	1240	1350	15407
01-14-87	10102	130.2	14.1	106	7.13	6.17	0.0	107	128	30	24	12	14	0	45	3	1450	70	1540	1050	15626
06-02-87	12360	135.4	14.5	106	6.40	7.29	0.0	81	134	38	20	6	9	0	20	16	2380	100	1570	1420	16147
OIL CHANGE AT 13645 MILES																					
10-16-87	15706	152.1	15.5	104	3.20	9.99	0.0	19	16	9	3	4	2	0	11	60	2030	30	1270	1090	16787
05-16-88	20618	151.6	15.6	105	3.82	4.49	0.0	238	273	66	21	13	23	0	35	2	1530	60	1100	1200	17632
TRANSFERRED TO SIDP @ 20618 MILES																					
OIL CHANGE TO PARAMINS 10W30 AT 20618 MI																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2900 ENGINE TYPE: V-6 CHEV S-10 FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL OIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
05-15-85	20	49.9	8.5	147	2.13	4.83	2.0	107	28	23	26	5	28	19	346	<1	12	1535	936	1047	14193
HAD ACCIDENT AT 1700 MILES																					
08-30-85	2563	59.7	9.7	124	2.25	3.48	.9	107	54	23	29	5	190	11	540	20	496	990	1072	1163	14577
OIL CHANGE AT 2563 MILES																					
10-11-85	3953	84.6	11.7	130	2.56	3.19	1.0	35	17	7	11	2	6	2	108	61	532	1510	1267	1329	14705
12-19-85	5715	88.9	11.4	118	3.40	3.62	1.7	59	30	8	18	7	4	2	124	25	537	1688	1207	1338	14841
OIL CHANGE AT 5913 MILES																					
12-24-85	5914	88.4	12.1	130	2.53	5.97	1.7	11	5	82	1	1	<1	<1	22	110	935	181	913	992	14842
01-08-86	7296	90.4	12.1	127	2.86	2.73	1.3	20	9	96	4	2	<1	1	20	87	1024	41	868	1017	14843
CONVERTED TO METHANOL AT 7296 MILES and B of A Oil Added																					
New Unused B of A Oil		137.4	14.4	103	3.01	10.61		1	<1	<1	<1	1	<1	<1	20	202	1903	6	1345	1263	14748
03-21-86	7862	128.2	13.6	101	2.93	5.88	0.0	43	28	18	5	5	3	<1	27	10	1229	24	1183	1158	14909
05-21-86	8881	130.5	13.3	96	7.07	6.73	.1	75	227	25	35	8	4	0	34	7	1790	108	1320	1238	15160
12-15-86	11654	130.8	18.8	165	4.32	4.15	0.0	151	197	26	35	14	6	0	36	2	1150	418	1358	1218	15703
OIL CHANGE AT 11655 MILES																					
03-03-87	12745	133.0	14.3	106	5.27	6.85	0.0	63	54	16	10	6	2	0	24	14	1520	60	1230	1160	15908
06-01-87	14103	145.9	14.4	96	6.28	5.61	0.0	165	85	20	19	14	5	0	30	2	2180	90	1488	1388	16146
OIL CHANGE AT 14103 MILES																					
09-08-87	15196	126.3	18.9	169	2.24	5.61	0.0	86	39	40	7	10	4	0	16	7	1010	170	1188	1068	16674
10-15-87	15668	116.5	13.1	107	6.17	4.49	0.0	109	32	19	7	10	2	0	19	3	1520	158	1238	1268	16807

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2901 ENGINE TYPE: V-6 CHEV S-10 FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
05-15-85	47	44.2	7.9	153	2.04	5.27	3.1	35	35	21	14	2	35	5	474	6	121	1275	990	1152	14107
06-19-85	2521	50.1	8.7	152	2.25	3.62	1.1	64	60	29	32	5	46	0	652	3	150	1360	1019	1160	14355
08-14-85	4915	50.3	8.4	142	3.32	1.61	1.7	97	137	23	38	5	153	0	676	1	136	1521	1051	1136	14563
OIL CHANGE AT 4915 MILES																					
CONVERTED TO METHANOL AT 5243 MILES and B of A Oil Added																					
New Unused B of A Oil		137.4	14.4	103	3.01	10.61		1	<1	<1	<1	1	<1	<1	20	282	1903	6	1345	1263	14740
09-09-85	5244	78.7	11.4	135	2.30	4.68	1.3	17	19	7	8	3	8	1	93	77	494	1510	1264	1428	14604
11-27-85	5440	124.4	13.3	101	2.32	5.32	.8	155	17	20	13	6	4	3	46	143	1072	178	1224	1159	14742
03-27-86	6770	139.5	14.3	100	2.95	2.69	0.0	215	522	28	65	0	6	5	65	6	1063	48	1292	1184	15018
05-30-86	9100	142.1	15.2	109	5.69	3.37	.1	298	433	30	65	14	10	0	56	3	1348	178	1258	1218	15169
07-01-86	10696	152.8	15.5	103	7.41	2.36	0.0	260	340	30	65	16	11	0	52	3	940	138	1098	1138	15217
07-31-86	11617	148.4	14.5	96	6.17	2.50	0.0	342	369	33	72	18	11	0	59	4	1248	198	1208	1378	15329
09-24-86	12859	161.9	15.2	94	8.02	1.35	0.0	487	411	40	69	20	13	0	61	3	1308	218	1298	1418	15466
OIL CHANGE AT 12859 MILES																					
11-06-86	14077	148.9	14.4	100	3.93	7.41	0.0	81	88	17	19	6	3	0	19	21	1288	58	1048	1288	15538
01-15-87	15648	142.8	18.8	149	7.57	5.61	0.0	108	121	21	26	10	5	0	26	3	1488	78	1538	1118	15828
OIL CHANGE AT 15649 MILES																					
03-06-87	16762	133.2	14.4	107	5.27	7.29	0.0	55	32	11	8	4	2	0	14	15	1398	28	1188	1048	15917
05-07-87	18184	143.7	14.9	104	5.84	4.71	0.0	145	48	15	10	11	4	0	28	3	1928	48	1378	1218	16078
06-19-87	19370	133.8	14.2	104	4.32	7.74	0.0	59	18	11	8	6	1	0	16	19	1988	38	1288	1418	16245
10-15-87	21707	147.9	15.2	104	6.73	5.95	0.0	191	23	14	21	8	6	0	27	5	2668	48	2058	1518	16888
OIL CHANGE AT 23430 MILES																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM2902 ENGINE TYPE: V-6 CHEV S-10 FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
05-15-85	81	46.0	8.5	164	2.05	3.14	2.8	83	31	16	15	2	43	6	504	<1	10	909	967	1093	14195
09-03-85	3068	51.1	8.5	143	2.44	1.30	.9	204	87	24	42	8	340	15	980	<1	20	1440	1112	1159	14584
OIL CHANGE AT 3068 MILES																					
10-29-85	6152	84.1	12.0	138	2.99	2.71	1.2	42	20	7	10	3	6	2	175	33	362	1610	1116	1147	14711
12-02-85	7705	89.9	12.1	128	3.86	2.30	1.4	64	28	10	14	6	14	4	232	40	448	921	1269	1307	14743
CONVERTED TO METHANOL AT 7705 MILES and B of A Oil Added																					
New Unused B of A Oil		137.4	14.4	103	3.01	10.61		1	<1	<1	<1	1	<1	<1	20	202	1903	6	1345	1263	14748
02-28-86	9468	134.2	13.9	98	2.54	3.46	0.0	73	842	19	98	7	7	3	75	5	1066	328	1256	1195	14956
05-07-86	10627	126.8	13.0	95	3.16	2.54	40.0	154	735	21	93	10	7	0	7	3	933	610	1376	1395	15133
09-12-86	13063	126.5	13.6	103	4.60	3.14	0.0	395	420	33	79	17	8	0	82	2	860	730	1110	1550	15428
11-24-86	14136	100.8	14.3	69	4.20	1.50	0.0	459	404	32	61	21	7	0	69	1	890	700	1130	1400	15500
OIL CHANGE AT 14146 MILES																					
OIL CHANGE AT 15152 MILES																					
03-02-87	15153	89.4	16.8	204	2.69	5.27	0.0	27	129	20	17	10	3	0	42	6	1270	320	1300	1150	15090
05-13-87	16390	143.1	18.6	146	4.60	5.95	0.0	95	49	13	8	9	3	0	22	10	1660	50	1270	1180	16000
OIL CHANGE AT 16391 MILES																					
07-28-87	17570	130.5	13.4	97	4.49	6.85	0.0	71	19	9	0	8	2	0	18	7	1420	10	1020	950	16457
08-03-87	17690	138.4	14.9	108	5.61	6.96	0.0	102	20	11	6	8	3	0	18	3	1700	30	1240	1170	16469
10-16-87	19003	157.7	15.7	102	7.86	4.38	0.0	317	58	19	11	14	9	0	45	3	2100	50	1470	1560	16810
OIL CHANGE AT 20419 MILES																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
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VEHICLE USA #: CM3613 ENGINE TYPE: L-4 CHEV CITATION PRESIDIO METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
New Unused B of A Oil		137.0	13.7	94	2.22			1	<1	14	<1	1	<1	<1	10	221	1140	10	1555	1257	14363
05-29-85	18029	130.9	13.1	94	2.40	7.07	0.0	39	10	26	5	7	1	1	20	157	1131	60	1981	1256	14360
06-20-85	20125	154.5	14.9	95	3.94	2.10	0.0	69	173	57	29	9	9	4	23	14	1110	90	1807	1150	14453
07-08-85	22357	107.7	16.0	94	5.96	1.30	0.0	97	292	105	42	0	15	0	29	6	1113	114	1771	1157	14452
08-27-85	28003	193.2	17.4	96	5.05	1.57	0.0	59	114	80	22	4	10	2	24	15	1140	<1	1294	1046	14627
OIL CHANGE AT 28003 MILES																					
09-05-85	30320	160.7	15.2	95	2.94	4.10	0.0	22	24	31	4	2	4	1	15	37	1134	<1	1131	1043	14626
09-23-85	33227	106.8	16.9	95	5.24	2.60	0.0	44	65	63	17	2	0	1	26	15	1264	36	1204	1102	14674
OIL FILTER CHANGE, 1 QT ADDED																					
OIL CHANGE AT 35239 MILES																					
10-07-85	35240	159.5	15.0	93	3.57	2.57	.1	26	42	35	7	3	4	1	22	6	1302	27	1224	1152	14675
11-08-85	36417	143.5	14.2	96	2.45	3.64	.4	52	58	54	15	6	5	<1	20	10	1237	31	1250	1102	14719
11-28-85	37149	157.4	15.4	98	3.57	2.38	0.0	65	68	68	20	7	5	1	22	4	1263	33	1211	1146	14733
01-08-86	37495	134.9	13.7	96	2.56	2.18	1.0	153	91	91	28	12	10	2	34	6	966	40	1253	1101	14832
OIL CHANGE AT 37495 MILES																					
02-11-86	37529	132.3	13.6	96	3.09	2.10	0.0	231	145	101	31	17	12	4	36	4	1150	44	1240	1097	14896
04-11-86	39178	154.8	15.1	97	2.59	2.80	0.0	272	245	149	38	14	11	6	34	10	974	39	1192	1114	15026
05-27-86	40258	177.9	16.8	100	4.43	1.57	0.0	427	270	188	44	20	20	0	41	4	1080	70	1358	1320	15158
08-04-86	44457	101.3	21.0	137	6.56	1.01	0.0	461	239	201	49	23	22	0	43	7	1180	90	1390	1350	15338
OIL CHANGE AT 44457 MILES																					
08-15-86	45989	160.3	15.9	102	3.40	5.05	0.0	72	40	61	9	9	4	0	17	9	1120	40	1228	1260	15415
09-05-86	48097	102.3	15.0	154	2.86	3.98	0.0	73	32	50	0	9	4	0	10	3	610	530	1188	1278	15395
09-22-86	49154	111.9	17.4	171	3.48	2.24	0.0	86	42	73	9	9	5	0	20	2	590	600	1230	1240	15457
OIL CHANGE AT 49154 MILES																					
09-22-86	49155	140.1	14.4	101	2.81	9.88	0.0	0	3	3	2	0	0	0	9	170	1040	10	1410	1240	15458

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM3613 ENGINE TYPE: L-4 CHEV CITATION PRESIDIO METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
New Unused B of A Oil		137.8	13.7	94	2.22			1	<1	14	<1	1	<1	<1	10	221	1140	10	1555	1257	14363
03-30-87	57939	133.1	16.6	134	3.25	3.14	0.0	164	147	137	16	14	14	0	10	3	1220	420	1130	1200	15903
OIL CHANGE AT 57940 MILES																					
05-13-87	60120	144.2	15.2	107	5.05	5.95	0.0	46	21	44	4	6	2	0	21	45	1740	30	1340	1200	16230
OIL CHANGE AT 60120 MILES																					
06-10-87	62039	147.0	16.2	116	6.96	4.38	0.0	261	82	124	17	20	10	0	80	5	1900	70	1540	1330	16212
OIL CHANGE AT 62041 MILES																					
06-10-87	62042	135.1	13.5	94	2.69	8.08	0.0	2	4	2	5	0	0	0	7	182	2640	30	1660	1400	16213
06-11-87	62642	131.4	15.3	120	3.03	7.97	0.0	46	21	44	4	6	2	0	21	45	1740	30	1340	1200	16232
11-30-87	62913	154.0	12.6	64	2.47	6.06	0.0	295	60	89	14	24	8	0	40	10	1070	0	1230	1200	17513

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM3614 ENGINE TYPE: V-6 CHEV CITATION PRESIDIO METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	OFLINE CODE
New Unused B of A Oil		137.0	13.7	94	2.22			1	<1	14	<1	1	<1	<1	10	221	1140	10	1555	1257	14363
05-29-85	18333	132.5	13.3	95	2.49	5.84	Trace	82	27	34	7	4	2	1	59	73	1124	28	1230	1254	14359
07-15-85	22340	167.1	15.6	95	3.93	2.20	0.0	119	266	34	32	9	13	2	101	12	1191	49	1362	1229	14458
OIL CHANGE AT 22340 MILES																					
08-27-85	25455	155.6	14.9	94	2.47	4.47	0.0	9	14	6	<1	1	2	<1	17	20	1146	<1	1136	1044	14620
OIL CHANGE AT 25455 MILES																					
09-04-85	26101	152.6	14.6	94	2.44	5.91	0.0	6	7	5	<1	1	1	<1	13	52	1104	<1	1123	1013	14629
OIL CHANGE AT 26101 MILES																					
09-23-85	27200	157.5	15.0	95	3.08	2.60	0.0	24	34	9	6	2	3	1	19	5	1295	24	1224	1176	14673
10-07-85	28117	159.0	15.4	97	3.10	2.77	0.0	26	43	9	6	3	3	1	21	10	1342	26	1223	1192	14672
OIL CHANGE AT 29186 MILES																					
11-09-85	30388	154.4	14.9	96	2.02	7.97	< .9	44	31	7	10	4	2	<1	19	6	1283	26	1244	1190	14724
01-13-86	34685	202.8	18.3	100	7.66	.71	0.0	280	415	23	27	10	10	7	34	2	1211	425	1369	1503	14856
OIL CHANGE AT 34685 MILES																					
02-11-86	38123	199.6	17.7	96	5.54	2.03	0.0	136	192	21	15	6	8	3	22	5	1388	142	1377	1432	14892
OIL CHANGE AT 38123 MILES																					
02-11-86	38124	153.8	14.6	93	2.82	7.73	0.0	11	13	4	<1	<1	5	<1	25	5	1241	25	1248	1164	14893
02-20-86	39144	160.9	15.6	98	3.35	2.90	< .3	36	37	23	4	2	6	<1	16	46	1295	38	1294	1276	14907
03-07-86	40858	187.9	16.7	93	5.60	2.26	0.0	65	92	26	8	5	8	1	16	9	1351	44	1265	1239	14954
OIL CHANGE AT 41209 MILES																					
03-19-86	42247	154.4	15.0	96	3.16	5.23	0.0	33	20	13	3	4	6	<1	37	131	1158	24	1193	1071	14976

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM3614 ENGINE TYPE: V-6 CHEV CITATION PRESIDIO METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
New Unused B of A Oil		137.0	13.7	94	2.22			1	<1	14	<1	1	<1	<1	10	221	1140	10	1555	1257	14363
03-25-86	43303	163.5	15.6	97	3.33	2.71	0.0	40	16	19	8	3	1	2	29	83	1673	94	1200	1108	14900
04-02-86	44121	162.8	15.5	97	2.78	2.56	0.0	45	29	16	4	5	3	<1	27	3	1299	26	1313	1212	15014
06-17-86	45176	148.6	15.2	103	3.20	5.11	0.0	57	29	20	5	9	5	0	34	12	1190	20	1320	1110	15190
06-26-86	46388	165.2	16.2	102	4.43	3.98	0.0	66	59	29	10	10	7	0	31	5	1100	30	1230	1170	15206
DEADLINED 7-6-86 @47217 MILES																					
08-20-86	47262	176.7	16.5	98	5.27	3.40	0.0	89	85	36	10	13	0	0	33	4	1220	40	1350	1390	15392
OIL CHANGE AT 47263 MILES																					
08-20-86	47264	137.2	16.0	132	2.36	6.79	0.0	2	2	4	0	0	0	0	15	180	1250	30	1200	1210	15393
RETURNED TO DUTY 10-5-86 @ 47270 MILES																					
10-17-86	47923	154.7	14.0	95	2.92	6.96	0.0	27	29	34	9	4	6	0	14	28	1200	30	1010	1290	15506
OIL CHANGE AT 53115 MILES																					
12-02-86	53116	139.1	13.6	92	1.74	9.20	0.0	3	9	1	0	0	0	0	6	171	1030	20	1660	1250	15505
01-08-87	55009	136.3	18.0	156	3.93	5.39	0.0	76	42	19	6	13	4	0	10	5	1690	80	1340	1270	15705
OIL CHANGE AT 56159 MILES																					
01-30-87	56160	134.6	14.1	102	3.37	8.19	0.0	18	10	9	3	2	0	0	6	21	1630	330	1760	1190	15832
02-05-87	57036	142.5	14.9	105	2.92	8.08	0.0	19	17	7	0	3	1	0	6	62	1590	100	1350	1170	15839
03-25-87	58939	110.0	13.2	107	4.26	6.06	0.0	43	30	11	3	6	2	0	0	7	1300	360	1100	1320	15902
OIL CHANGE AT 61704 MILES																					
05-07-87	61705	100.4	14.1	132	3.00	8.50	0.0	5	7	0	0	0	0	0	5	206	2050	60	1350	1550	16077
06-04-87	63087	144.7	14.7	100	4.15	6.73	0.0	35	29	23	2	9	2	0	10	33	2460	270	1640	1610	16143
01-15-88	65640	141.5	14.6	162	3.37	5.84	0.0	108	53	26	12	14	3	0	24	11	1420	300	1360	1710	17514

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM3615 ENGINE TYPE: L-4 CHEV CITATION PRESIDIO METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
New Unused B of A Oil		137.0	13.7	94	2.22			1	<1	14	<1	1	<1	<1	18	221	1140	18	1555	1257	14363
05-29-85	16165	132.3	13.3	94	2.62	6.17	0.0	39	21	24	7	5	1	<1	25	161	1007	57	1706	1244	14361
06-20-85	18635	150.1	15.1	95	3.99	2.30	0.0	68	409	77	52	11	12	4	30	7	1172	98	1748	1184	14449
07-08-85	20435	174.6	15.9	93	6.04	1.50	0.0	91	480	118	74	13	20	7	38	4	1173	116	1735	1238	14451
OIL CHANGE AT 20435 MILES																					
08-27-85	26284	204.0	17.7	93	7.52	.49	0.0	59	204	139	40	5	12	<1	31	3	1097	<1	1363	1095	14630
OIL CHANGE AT 26284 MILES																					
09-04-85	27235	154.2	14.8	95	2.74	3.71	0.0	15	30	35	4	2	4	<1	14	20	1046	<1	1188	963	14631
09-23-85	29749	158.4	15.7	101	4.14	2.74	0.0	24	55	57	12	3	5	1	21	36	1232	32	1184	1130	14671
OIL CHANGE AT 29749 MILES																					
10-03-85	31240	145.8	15.0	103	3.02	2.91	0.0	15	34	34	10	2	3	1	18	4	1233	23	1158	1189	14670
11-06-85	33610	163.9	15.5	95	4.37	1.94	0.0	63	169	116	45	8	10	2	32	4	1330	45	1231	1213	14694
OIL CHANGE AT 33610 MILES																					
11-06-85	33611	141.5	14.5	101	2.82	6.49	0.0	7	15	13	3	<1	1	<1	28	165	1212	20	1129	1092	14693
12-16-85	35715	155.3	14.9	95	3.26	2.42	0.0	81	115	85	25	6	6	1	30	6	1333	42	1234	1229	14829
02-11-86	36356	117.7	13.9	110	2.55	3.07	0.0	72	83	87	13	3	6	1	24	3	1053	29	1075	1020	14894
OIL CHANGE AT 36356 MILES																					
02-11-86	36357	144.8	14.3	96	2.71	7.86	0.0	8	6	10	<1	<1	<1	<1	26	169	1168	19	1212	1111	14895
02-28-86	38670	157.2	15.2	97	3.22	2.61	0.0	43	49	49	12	3	5	<1	22	4	1293	29	1211	1190	14928
03-10-86	40261	171.5	16.0	96	5.03	2.24	0.0	59	82	79	18	4	4	1	29	2	1265	37	1205	1188	14955
OIL CHANGE AT 40261 MILES																					
03-10-86	40262	148.8	14.4	94	2.77	7.64	0.0	7	6	9	2	<1	<1	<1	25	159	1185	19	1169	1078	14953

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM3615 ENGINE TYPE: L-4 CHEV CITATION PRESIDIO METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	DFLRF CODE
New Unused B of A Oil		137.8	13.7	94	2.22			1	<1	14	<1	1	<1	<1	10	221	1140	10	1555	1257	14363
04-25-86	41285	158.4	15.2	96	3.14	5.16	0.0	41	55	44	9	5	2	0	19	13	1520	50	1250	1310	15170

HAD ACCIDENT, NOT IN PROGRAM ANY LONGER

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CM3616 ENGINE TYPE: V-6 CHEV CITATION PRESIDIO METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
New Unused B of A Oil		137.8	13.7	94	2.22			1	<1	14	<1	1	<1	<1	18	221	1148	18	1555	1257	14363
05-29-85	28257	135.2	13.6	95	2.19	6.06	Trace	31	63	43	9	3	3	<1	59	129	1151	59	1200	1252	14362
06-24-85	30244	153.5	14.6	93	3.11	2.90	0.0	55	295	40	38	5	11	2	96	5	1195	42	1206	1173	14448
07-15-85	32257	180.0	16.4	95	4.07	1.99	0.0	89	424	47	54	9	14	4	104	3	1250	69	1321	1295	14454
OIL CHANGE AT 32257 MILES																					
08-26-85	34090	151.7	14.9	98	2.82	4.37	0.0	31	50	12	3	2	6	<1	23	13	1048	<1	1119	1021	14632
OIL CHANGE AT 34090 MILES																					
09-20-85	35000	153.1	14.7	94	2.64	4.47	0.0	28	7	9	1	2	<1	<1	23	15	1269	24	1247	1195	14677
11-08-85	37552	167.4	15.6	94	4.43	2.25	0.0	98	63	13	20	8	9	2	45	2	1360	41	1243	1255	14718
OIL CHANGE AT 37552 MILES																					
11-08-85	37553	150.7	14.5	94	2.51	6.87	0.0	6	5	3	<1	<1	5	<1	28	170	1167	19	1169	1062	14717
01-15-86	39370	158.5	15.1	96	4.50	2.64	0.0	86	31	11	12	5	2	2	40	2	1273	33	1221	1159	14855
OIL CHANGE AT 40595 MILES																					
02-11-86	40596	152.7	14.6	94	2.91	8.08	0.0	9	4	3	<1	<1	5	<1	24	171	1211	18	1201	1127	14897
03-07-86	41463	157.3	15.2	97	2.85	4.53	0.0	34	13	9	2	2	1	<1	23	10	1253	24	1222	1137	14952
04-09-86	43210	159.7	15.3	97	3.23	5.11	1.1	27	12	6	2	3	<1	1	20	29	1196	22	1135	1128	15025
05-05-86	44220	164.8	15.7	97	3.95	3.01	.2	54	17	7	7	3	1	1	32	2	1376	29	1392	1349	15121
06-04-86	45316	166.5	16.0	99	5.05	3.65	0.0	78	28	10	8	6	2	0	28	2	1380	40	1350	1300	15171
06-17-86	45965	173.9	17.9	113	4.04	3.59	0.0	71	30	9	11	6	2	0	21	3	1700	30	1400	1240	15184
08-15-86	48242	168.1	16.2	100	5.11	4.38	0.0	85	52	20	11	7	2	0	25	6	1200	48	1270	1310	15391
OIL CHANGE AT 48242 MILES																					
08-15-86	48243	149.1	15.0	101	2.97	7.46	0.0	2	2	4	0	0	0	0	14	193	1100	20	1290	1150	15390
10-01-86	49612	163.9	15.8	99	3.76	5.05	0.0	39	18	16	5	5	0	0	16	3	1270	30	1300	1210	15459
10-29-86	50721	158.2	15.1	92	4.60	4.71	0.0	39	16	12	7	4	1	0	12	1	780	30	900	1110	15505
11-19-86	51587	162.0	15.8	100	4.15	4.60	0.0	50	22	13	6	6	1	0	15	15	1270	30	1340	1260	15570
07-08-87	56405	181.0	20.2	130	7.63	1.80	0.0	399	297	42	11	13	9	0	26	1	1070	400	1340	1350	16260
12-15-87	58870	123.7	11.6	76	3.93	2.92	0.0	354	184	37	11	13	8	0	16	1	490	30	1150	1210	17515

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

VEHICLE USA #: CH0436 ENGINE TYPE: I-4 FORD ESCORT FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	DFLRF CODE
FORD ESCORT RECEIVED FROM CEC																					
NEW UNUSED B OF A OIL																					
07-27-86	9181	100.9	15.3	160	2.92	7.74	0.0	24	9	2	0	9	0	0	7	5	630	1730	1690	1960	15337
04-17-87	11306	92.5	18.3	219	2.47	2.81	0.0	79	23	10	0	15	0	0	9	0	410	1090	1590	1360	16030
06-22-87	12589	98.0	11.8	110	3.37	2.81	0.0	98	27	14	0	20	2	0	9	0	340	1120	1020	1320	16246
OIL CHANGE AT 13649 MILES																					
09-08-87	13650	94.2	10.8	98	3.03	4.94	0.0	37	12	7	0	8	0	0	6	0	350	1030	1300	1300	16671
OIL CHANGE AT 16599 MILES																					
05-16-88	19326	97.2	12.4	121	3.59	4.49	0.0	103	38	22	0	13	0	0	11	0	450	1370	1150	1560	17631
TRANSFERRED TO SIDP @ 19326 MILES																					
OIL CHANGE TO PARAMINS 10W30 AT 19327 MI																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
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VEHICLE USA #: CH0437 ENGINE TYPE: I-4 FORD ESCORT FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
FORD ESCORT RECEIVED FROM CEC																					
NEW UNUSED B OF A OIL																					
07-28-86	12061	91.5	12.1	125	2.36	2.92	0.0	51	35	10	0	11	1	0	8	0	200	980	1200	1380	15341
10-31-86	13397	127.6	12.9	93	2.81	2.36	0.0	94	49	13	9	20	2	0	12	0	260	1170	920	1620	15514
OIL CHANGE AT 14392 MILES																					
02-13-87	14433	102.6	13.6	132	3.31	6.40	0.0	24	13	5	0	5	0	0	5	9	610	1230	1600	1470	15859
07-08-87	16667	119.4	12.9	101	4.71	6.51	0.0	29	19	13	0	8	0	0	10	7	1440	140	1350	1290	16430
09-04-87	17735	127.6	15.8	130	5.05	5.95	0.0	28	23	13	2	9	0	0	8	3	1160	100	1170	1050	16670
11-02-87	18681	120.4	11.5	78	2.02	4.26	0.0	55	60	21	6	14	1	0	0	1	1060	130	1470	1280	16850
OIL CHANGE AT 18682 MILES																					
OIL CHANGE AT 24001 MILES																					
05-11-88	24008	81.0	10.9	121	3.14	3.37	0.0	26	50	27	0	8	0	0	9	0	680	270	1060	1300	17613
TRANSFERRED TO SIDP @ 24008 MILES																					
OIL CHANGE TO PARAMINS 10W30 AT 24009 MI																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
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VEHICLE USA #: CH0430 ENGINE TYPE: I-4 FORD ESCORT FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
FORD ESCORT RECEIVED FROM CEC																					
NEW UNUSED 8 OF A OIL																					
07-28-86	12211	81.8	10.8	110	2.52	7.24	0.0	69	15	5	0	7	0	0	11	3	640	1750	1590	1000	15340
10-02-86	13201	97.2	12.0	114	2.19	7.63	0.0	85	23	8	2	13	1	0	14	1	580	1500	1460	1710	15460
12-11-86	14595	96.6	11.6	100	2.01	5.84	0.0	113	38	12	5	20	1	0	16	0	590	1610	1500	1560	15700
OIL CHANGE AT 15983 MILES																					
05-29-87	17071	97.6	16.9	109	2.69	2.81	0.0	50	20	13	0	9	0	0	9	0	590	1310	1630	1630	16145
08-25-87	18199	91.2	11.5	115	4.04	3.59	0.0	83	33	20	0	15	1	0	14	0	520	1210	1380	1620	16576
10-30-87	19718	93.6	11.6	113	2.81	0.00	0.0	122	63	25	3	17	2	0	12	0	420	1220	1430	1360	16848
OIL CHANGE AT 19719 MILES																					
TRANSFERRED TO SIDP @ 22843 MILES																					
05-10-88	22844	105.1	13.1	121	2.92	8.75	0.0	50	25	17	0	4	0	0	8	5	750	1810	1600	1940	17612
OIL CHANGE TO PARAMINS 10W30 AT 22844 MI																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

VEHICLE USA #: CH0439 ENGINE TYPE: I-4 FORD ESCORT FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
FORD ESCORT RECEIVED FROM CEC																					
NEW UNUSED B OF A OIL																					
07-28-86	11693	85.7	11.5	124	2.13	2.30	0.0	55	23	5	0	9	0	0	0	0	390	1410	1370	1600	15339
09-12-86	12661	97.4	13.6	140	2.69	3.09	0.0	59	27	6	0	13	0	0	9	1	500	1350	1250	1700	15429
03-02-87	14420	93.9	11.6	112	2.36	2.81	0.0	95	44	15	3	15	2	0	11	0	440	1400	1260	1450	15099
OIL CHANGE AT 14422 MILES																					
05-08-87	15572	93.2	11.4	110	3.14	5.61	0.0	34	15	9	0	8	0	0	9	0	610	1300	1510	1610	16073
08-17-87	16798	90.7	11.5	117	3.14	3.82	0.0	57	25	14	0	12	0	0	9	0	420	1810	1320	1370	16570
OIL CHANGE AT 18434 MILES																					
05-04-88	19196	90.3	11.6	118	2.36	4.60	0.0	37	35	24	0	9	0	0	6	0	420	1440	1290	1630	17610
TRANSFERRED TO SIDP @ 19196 MILES																					
OIL CHANGE TO PARAMINS 10W30 AT 19196 MI																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

VEHICLE USA #: CH0440 ENGINE TYPE: I-4 FORD ESCORT FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
FORD ESCORT RECEIVED FROM CEC																					
NEW 8 OF A OIL																					
07-28-86	12524	98.4	15.1	161	2.92	5.50	0.0	21	8	1	0	4	0	0	8	4	630	1600	1560	1870	15330
09-11-86	13643	93.2	12.6	131	2.81	7.07	0.0	45	13	3	0	9	0	0	6	1	580	1460	1340	1850	15424
12-09-86	14600	87.5	11.7	125	2.69	5.72	0.0	78	23	6	0	15	0	0	9	0	500	1490	1540	1610	15660
02-27-87	15756	88.1	12.5	138	3.37	4.04	0.0	102	35	13	0	19	1	0	9	0	548	1360	1490	1520	15892
OIL CHANGE AT 15757 MILES																					
05-08-87	17052	100.5	12.4	116	3.82	5.84	0.0	61	21	6	0	13	0	0	10	0	590	1460	1450	1710	16074
07-30-87	18381	94.4	13.5	144	2.69	4.00	0.0	84	35	10	0	16	1	0	8	0	0	1200	1150	1410	16467
10-24-87	19497	97.3	11.1	99	3.93	2.47	0.0	133	63	14	0	19	0	0	10	0	440	1360	1410	1400	16755
OIL CHANGE AT 19719 MILES																					
11-05-87	20248	109.9	12.8	110	2.47	0.00	0.0	103	63	25	4	18	2	0	9	2	910	920	1300	1410	16049
OIL CHANGE AT 20249 MILES																					
OIL CHANGE AT 21897 MILES																					
05-17-88	23502	95.1	12.0	117	3.59	7.07	0.0	75	34	27	0	11	0	0	7	0	510	1390	1290	1550	17634
TRANSFERRED TO SIDP @ 23503 MILES																					
OIL CHANGE TO PARAMINS 10W30 AT 23503 MI																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

VEHICLE USA #: CH0445 ENGINE TYPE: I-4 FORD ESCOPT SADP METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
FORD ESCORT RECEIVED FROM CEC																					
DEADLINED SINCE 1-6-87 @ 9946 MILES																					
NEW UNUSED 20W-40 MOTOR CRAFT OIL																					
OIL CHANGE AT 9988 MILES																					
04-01-87	9989	92.7	18.1	216	2.81	7.63	0.0	83	21	4	0	12	0	0	9	1	530	1460	1240	1540	16002
NO FUEL DATA REPORTED FOR 632 MILES																					
07-09-87	13783	106.8	13.8	130	2.81	5.27	0.0	75	20	4	0	9	1	0	8	0	610	1680	1640	1790	16419
OIL CHANGE AT 13783 MILES																					
10-20-87	14737	104.5	13.0	120	2.69	5.05	0.0	23	7	1	0	4	0	0	7	1	370	1230	1520	1480	16799
OIL CHANGE AT 14737 MILES																					
03-02-88	15720	94.8	12.3	123	2.19	6.62	0.0	32	12	9	0	12	0	0	8	0	370	980	1180	1150	17390
OIL CHANGE TO PAMAMIHS 10W30 AT 15720 MI																					
07-11-88	16488	70.3	11.8	164	2.64	8.87	0.0	37	10	5	0	8	0	0	7	0	130	2690	1500	1570	17744
OIL CHANGE AT 16488 MILES																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE I & II

VEHICLE USA #: CH0491 ENGINE TYPE: V-6 CHEV CITATION FT. ORD METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
SENT TO FOCA FROM JPL																					
NEW UNUSED 5 OF A OIL																					
OIL CHANGE AT 32398 MILES																					
02-27-87	33399	107.1	11.3	90	2.58	5.16	0.0	108	112	31	19	13	3	0	46	5	1370	240	1490	1300	15093
07-28-87	35061	114.2	13.1	110	2.81	5.39	0.0	117	103	22	11	16	6	0	57	3	1200	440	1240	1400	16458
10-14-87	35960	112.9	12.8	107	2.69	4.71	0.0	179	147	27	18	17	7	0	73	3	1330	600	1570	1660	16804
OIL CHANGE AT 37168 MILES																					
05-17-88	39440	145.6	15.0	103	2.81	6.96	0.0	107	39	16	3	15	2	0	42	4	1470	380	1430	1350	17635
TRANSFERRED TO SIDP # 39440 MILES																					
OIL CHANGE TO PARAMINS 10W30 AT 39441 MI																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

VEHICLE USA #: CH0539 ENGINE TYPE: I-4 FORD ESCORT SADP METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
FORD ESCORT RECEIVED FROM CEC																					
NEW UNUSED 20W-40 MOTOR CRAFT OIL																					
02-18-87	11002	87.4	11.7	125	1.80	4.04	3.0	100	36	10	3	20	1	0	11	0	330	1100	1090	1400	16001
OIL CHANGE AT 11002 MILES																					
05-17-87	15142	100.0	12.3	116	2.36	3.93	0.0	97	21	10	2	20	0	0	11	0	560	1310	1600	1570	16095
OIL CHANGE AT 15142 MILES																					
08-26-87	16502	96.1	12.3	121	2.19	5.73	0.0	26	6	3	0	7	0	0	6	0	340	1060	1130	1230	16563
OIL CHANGE AT 16502 MILES																					
12-28-87	17873	81.8	11.0	122	1.91	3.93	0.0	21	7	3	0	5	0	0	5	0	180	750	830	1080	17089
OIL CHANGE AT 17873 MILES																					
01-25-88	18573	92.2	12.1	123	2.13	6.28	0.0	20	6	6	0	5	0	0	6	0	390	1310	1010	1390	17202
OIL CHANGE TO PARAMINS 10W30 AT 18573 MI																					
02-23-88	18734	65.9	8.3	94	2.81	10.80	0.0	12	5	2	0	3	0	0	5	1	100	2430	1310	1600	17329
OIL CHANGE AT 18734 MILES																					
05-18-88	19629	77.5	11.9	148	2.81	11.90	0.0	27	8	11	0	2	0	0	8	0	70	3340	1540	1870	17704
OIL CHANGE AT 19629 MILES																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

VEHICLE USA #: CH0540 ENGINE TYPE: I-4 FORD ESCORT SADP METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
FORD ESCORT RECEIVED FROM CEC																					
NEW UNUSED 20W-40 MOTOR CRAFT OIL																					
03-15-87	12270	81.7	10.9	120	2.24	2.02	0.0	131	27	15	4	24	2	0	11	0	320	1080	1100	1260	15952
OIL CHANGE AT 12270 MILES																					
05-13-87	12843	93.3	12.2	123	2.47	5.62	0.0	43	11	7	0	8	0	0	8	1	650	1490	1020	1760	16092
OIL CHANGE AT 12843 MILES																					
08-05-87	15902	105.6	13.1	120	3.48	5.84	0.0	50	9	6	0	12	0	0	6	0	440	1480	1360	1600	16475
OIL CHANGE AT 15902 MILES																					
12-10-87	16374	91.1	12.0	124	2.13	6.85	0.0	96	0	0	0	0	3	0	0	0	570	1450	1570	1500	16959
OIL CHANGE AT 16374 MILES																					
03-01-88	17345	72.9	10.3	126	1.35	4.60	0.0	39	8	7	0	5	0	0	0	0	350	550	1060	1190	17327
OIL CHANGE TO PARAMINS 10W30 AT 17345 MI																					
07-08-88	18730	94.2	12.1	121	1.51	5.39	0.0	43	9	9	0	6	0	0	8	0	550	1420	1560	1570	17742
OIL CHANGE AT 18730 MILES																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

VEHICLE USA #: CN0541 ENGINE TYPE: I-4 FORD ESCORT SADP METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	SFLRF CODE
FORD ESCORT RECEIVED FROM CEC																					
NEW UNUSED 20W-40 MOTOR CRAFT OIL																					
03-06-87	16076	75.7	10.8	130	2.58	1.46	0.0	219	58	15	5	21	1	0	10	0	270	910	940	970	15919
OIL CHANGE AT 16076 MILES																					
05-13-87	18418	79.5	11.3	132	2.30	5.73	0.0	100	26	19	0	15	0	0	10	0	590	1350	1730	1630	16094
OIL CHANGE AT 18418 MILES																					
08-26-87	20633	92.1	11.9	121	2.58	5.16	0.0	47	16	9	0	10	0	0	7	0	320	1030	1110	1200	16565
OIL CHANGE AT 20633 MILES																					
12-03-87	23070	86.6	11.4	121	2.13	6.06	0.0	51	13	8	0	11	1	0	9	0	380	1200	1370	1270	17040
OIL CHANGE AT 23070 MILES																					
01-03-88	24361	84.7	11.3	122	2.08	3.59	0.0	57	11	7	0	7	0	0	7	0	390	1100	1300	1360	17326
OIL CHANGE TO PARAMINS 10W30 AT 24361 MI																					
07-08-88	26341	65.0	9.0	115	2.81	7.29	0.0	53	12	7	0	10	1	0	11	0	110	2960	1470	1760	17746
OIL CHANGE AT 26341 MILES																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

VEHICLE USA #: CH0542 ENGINE TYPE: I-4 FORD ESCORT SADP METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
FORD ESCORT RECEIVED FROM CEC																					
NO ACTIVITY RECORDED SINCE 13815 MILES																					
NEW UNUSED 20W-40 MOTOR CRAFT OIL																					
OIL CHANGE AT 14315 MILES																					
06-29-87	15000	81.3	11.4	131	1.28	4.94	0.0	52	21	18	0	13	0	0	10	1	400	1320	1400	1540	16244
OIL CHANGE AT 15000 MILES																					
10-13-87	15591	76.5	10.5	122	2.47	6.62	0.0	33	13	6	0	8	0	0	7	1	360	1260	10	1290	16705
OIL CHANGE AT 15591 MILES																					
12-28-87	17611	79.0	11.2	132	3.70	6.28	0.0	20	5	2	0	7	0	0	4	0	210	840	870	1010	17090
O . CHANGE AT 17615 MILES																					
02-02-88	17805	88.8	13.7	157	2.36	6.96	0.0	23	3	0	0	2	0	0	4	1	330	1100	970	1290	17219
OIL CHANGE TO PARAMINS 10W30 AT 17805 MI																					
OIL CHANGE AT 17819 MILES																					
02-24-88	17963	91.2	12.0	129	2.81	7.41	0.0	16	5	1	0	4	0	0	6	2	610	1560	1580	1770	17331

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

VEHICLE USA #: CH0542 ENGINE TYPE: I-4 FORD ESCORT SADP METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	SFLRF CODE
OIL CHANGE AT 18447 MILES																					
05-18-88	18449	84.0	11.0	118	1.35	7.07	0.0	52	11	9	17	6	3	0	13	1	650	1340	1550	1770	17705

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

VEHICLE USA #: CN0543 ENGINE TYPE: I-4 FORD ESCORT SADP METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
FORD ESCORT RECEIVED FROM CEC																					
NO RECORDED DATA SINCE 12089 MILES																					
NEW UNUSED 20W-40 MOTOR CRAFT OIL																					
02-02-87	13372	95.8	11.4	106	2.47	5.27	0.0	77	25	9	2	13	0	0	9	0	440	1280	1430	1490	15884
OIL CHANGE AT 13772 MILES																					
06-25-87	15594	91.9	12.0	123	2.81	5.16	0.0	61	19	11	0	13	1	0	11	1	610	1370	1310	1740	16243
OIL CHANGE AT 15594 MILES																					
10-19-87	17980	103.3	17.7	189	3.82	5.05	0.0	42	13	6	0	12	0	0	10	1	410	1340	1410	1520	16791
OIL CHANGE AT 17980 MILES																					
01-26-88	18754	94.5	12.2	122	2.02	7.29	0.0	36	10	3	0	6	0	0	7	0	400	1250	1040	0	17195
OIL CHANGE TO PARAMINS 10W30 AT 18754 MI																					
04-28-88	20244	71.2	10.0	123	2.69	7.74	0.0	59	16	9	0	12	2	0	16	0	160	4770	1560	2280	17556
OIL CHANGE AT 20327 MILES																					
07-12-88	20499	73.6	9.6	109	.84	10.50	0.0	21	5	2	0	3	1	0	6	2	50	2970	1140	1790	17834
OIL CHANGE AT 20499 MILES																					

LUBRICANT D... AND TRACE METALS FROM
U.S. ARMY ... -FUELED ADMINISTRATIVE
VEHICLE DEMO ...H PROGRAM - PHASE II

VEHICLE USA #: CH0544 ENGINE TYPE: I-4 FORD ESCORT SADP METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	100 C	VI	TAN	TBN D664	FUEL OIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
FORD ESCORT RECEIVED FROM CEC																					
NO DATA GIVEN BETWEEN 2373 & 2938 MILES																					
NEW UNUSED 20W-40 MOTOR CRAFT OIL																					
02-05-87	3441	82.5	11.5	130	2.24	3.59	0.0	246	66	34	8	36	2	0	44	3	440	1680	890	1260	15887
OIL CHANGE AT 3441 MILES																					
06-01-87	4460	91.1	12.5	133	3.03	5.61	0.0	95	23	25	0	11	0	0	13	0	510	1320	1540	1500	16148
OIL CHANGE AT 4460 MILES																					
08-04-87	8947	102.6	12.5	115	3.59	4.83	0.0	99	16	13	0	19	0	0	11	0	450	1350	1380	1690	16474
OIL CHANGE AT 8947 MILES																					
09-30-87	12601	101.0	13.5	133	2.92	4.94	0.0	62	12	8	0	13	0	0	10	0	510	1460	1650	1640	16750
OIL CHANGE AT 12601 MILES																					
OIL CHANGE AT 12790 MILES																					
01-25-88	13109	98.2	12.7	124	3.25	7.63	0.0	19	6	0	0	3	0	0	5	0	440	1290	1060	1470	17203

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

VEHICLE USA #: CH0544 ENGINE TYPE: I-4 FORD ESCORT SADP METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
OIL CHANGE TO P.		VHS 10W30 AT 13109 MI																			
02-24-88	13879	78.5	10.1	110	2.86	11.20	0.0	32	9	4	0	7	0	0	0	0	130	3190	1520	1890	17330
04-27-88	14654	75.5	10.2	118	2.69	9.95	0.0	44	8	6	0	7	2	0	11	1	140	4040	1590	2340	17559
OIL CHANGE AT 14655 MILES																					
07-13-88	15463	80.7	10.2	108	2.52	10.50	0.0	37	10	5	0	10	2	0	9	1	50	3660	1430	1890	17851
OIL CHANGE AT 16463 MILES																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

VEHICLE USA #: CH0545 ENGINE TYPE: I-4 FORD ESCORT SADP METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL OIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
FORD ESCORT RECEIVED FROM CEC																					
NO DATA SINCE 12910 MILES																					
NEW UNUSED 20W-40 MOTOR CRAFT OIL																					
02-02-87	13548	107.2	12.3	106	2.58	4.38	0.0	156	34	12	0	19	0	0	13	0	620	1630	1620	1730	15885
OIL CHANGE AT 13548 MILES																					
04-08-87	18341	106.4	12.6	111	3.03	3.93	0.0	121	27	14	0	19	1	0	9	0	560	1450	1100	1590	16003
OIL CHANGE AT 18341 MILES																					
07-13-87	20819	106.3	12.2	105	2.24	3.82	0.0	111	21	11	0	15	1	0	11	0	550	1430	1440	1640	16423
OIL CHANGE AT 20819 MILES																					
10-07-87	22560	98.0	12.1	115	1.74	5.05	0.0	56	13	6	0	13	0	0	10	0	480	1370	1470	1520	16784
OIL CHANGE AT 22560 MILES																					
01-11-88	22613	93.3	12.1	123	.45	7.07	0.0	15	5	0	0	5	0	0	5	2	440	1470	1290	1540	17106
OIL CHANGE AT 22613 MILES																					
01-25-88	22733	98.0	11.2	100	3.14	7.52	0.0	12	3	0	0	3	0	0	3	2	410	1120	1040	1270	17200

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

VEHICLE USA #: CH0545 ENGINE TYPE: I-4 FORD ESCORT SADP METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
OIL CHANGE TO PARAMINS 10W30 AT 22733 MI																					
02-24-88	23004	72.4	9.6	111	1.80	12.50	0.0	14	4	1	0	4	0	0	0	2	120	2940	1520	1730	17333
OIL CHANGE AT 23087 MILES																					
05-11-88	23519	74.4	9.9	114	3.03	12.40	0.0	15	5	2	0	3	0	0	6	2	60	3450	1470	1020	17615
OIL CHANGE AT 23519 MILES																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

VEHICLE USA #: CH0546 ENGINE TYPE: I-4 FORD ESCORT SADP METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
FORD ESCORT RECEIVED FROM CEC																					
NO OPERATIONAL DATA 8164 TO 9049 MILES																					
NEW UNUSED 20W-40 MOTOR CRAFT OIL																					
02-04-87	9535	65.9	10.6	150	1.68	4.04	0.0	119	43	16	4	19	1	0	14	0	250	1260	1300	1370	15886
OIL CHANGE AT 9538 MILES																					
05-13-87	13628	105.9	12.6	112	3.03	4.83	0.0	112	24	16	0	16	0	0	10	0	680	1590	1860	1810	16093
OIL CHANGE AT 13628 MILES																					
08-03-87	17004	113.6	14.5	130	2.92	4.04	0.0	91	21	8	0	15	2	0	10	0	400	1250	1150	1520	16473
OIL CHANGE AT 17004 MILES																					
11-24-87	18356	84.6	10.9	115	1.35	5.50	0.0	60	0	0	0	0	0	0	0	0	340	1080	1190	1250	16960
OIL CHANGE AT 18356 MILES																					
03-02-88	20704	98.5	14.3	149	1.12	2.69	0.0	67	16	13	0	8	0	0	0	0	310	1010	1250	1350	17328
OIL CHANGE TO PARAMINS 10W30 AT 20704 MI																					
07-11-88	22163	79.6	10.3	112	2.47	7.07	0.0	64	19	11	0	10	1	0	11	0	130	2890	1610	1630	17800
OIL CHANGE AT 22163 MILES																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

VEHICLE USA #: CN0547 ENGINE TYPE: I-4 FORD ESCORT SADP METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	FPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
FORD ESCORT RECEIVED FROM CEC																					
NEW UNUSED 20W-40 MOTOR CRAFT OIL																					
02-16-87	12671	84.3	11.8	132	2.02	8.75	0.0	151	15	4	0	11	0	0	10	2	620	1400	1700	1540	15888
OIL CHANGE AT 12671 MILES																					
05-17-87	17580	106.7	12.9	116	3.14	3.14	0.0	118	13	10	0	24	0	0	17	0	590	1560	1840	1740	16896
OIL CHANGE AT 17580 MILES																					
08-25-87	19920	108.3	12.3	120	3.03	6.40	0.0	26	7	2	0	8	0	0	7	1	420	1250	1170	1300	16562
OIL CHANGE AT 19920 MILES																					
12-16-87	24581	104.7	13.3	125	3.03	1.91	0.0	93	24	10	0	18	1	0	9	0	380	1250	1310	1220	17066
OIL CHANGE AT 24581 MILES																					
04-03-88	25185	92.9	16.5	193	2.02	5.61	0.0	35	10	5	0	11	0	0	0	0	380	1800	1190	1190	17391
OIL CHANGE TO PARAMINS 10W30 AT 25185 MI																					
07-08-88	26114	71.1	10.5	135	2.69	8.30	0.0	28	10	4	0	6	0	0	7	0	140	2790	1670	1640	17743
OIL CHANGE AT 26114 MILES																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
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VEHICLE USA #: CH0548 ENGINE TYPE: I-4 FORD ESCORT SADP METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
FORD ESCORT RECEIVED FROM CEC																					
NEW UNUSED 20W-40 MOTOR CRAFT OIL																					
02-16-87	14114	85.3	12.3	140	1.68	5.27	0.0	96	25	11	3	18	1	0	9	1	320	1010	1340	1330	15089
OIL CHANGE AT 14114 MILES																					
06-04-87	15759	100.3	13.0	126	2.81	6.96	0.0	63	16	11	0	11	0	0	9	3	1000	1450	1690	1720	16153
OIL CHANGE AT 15759 MILES																					
10-05-87	16083	97.1	17.2	194	2.19	5.95	0.0	22	8	4	0	6	0	0	6	1	420	1200	1450	1370	16703
OIL CHANGE AT 16083 MILES																					
01-26-88	18325	81.0	11.1	125	4.38	5.72	0.0	40	10	7	0	7	0	0	8	0	480	1070	1000	1300	17194
OIL CHANGE TO PARAMINS 10W30 AT 18325 MI																					
04-27-88	18407	73.6	10.6	131	2.36	14.40	0.0	15	3	2	0	0	1	0	9	3	150	5140	1600	2360	17558
OIL CHANGE AT 18407 MILES																					
07-20-88	18727	68.8	8.6	95	1.12	11.50	0.0	18	10	11	0	0	1	0	8	1	120	3740	1500	2140	18101
OIL CHANGE AT 18727 MILES																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

VEHICLE USA #: CH0549 ENGINE TYPE: I-4 FORD ESCORT SADP METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL OIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
FORD ESCORT RECEIVED FROM CEC																					
NEW UNUSED 20W-40 MOTOR CRAFT OIL																					
03-15-87	14996	100.2	12.1	112	2.24	3.25	0.0	110	26	9	3	26	1	0	10	0	640	1480	1360	1750	15954
OIL CHANGE AT 14996 MILES																					
05-17-87	15872	100.2	18.1	201	2.24	6.62	0.0	45	10	4	0	13	0	0	9	0	670	1430	1840	1720	16097
OIL CHANGE AT 15872 MILES																					
07-09-87	16476	106.9	13.1	119	2.81	7.29	0.0	24	.	1	0	5	0	0	7	2	690	1650	1740	1810	16420
OIL CHANGE AT 16476 MILES																					
10-16-87	17052	100.6	12.4	116	3.14	7.18	0.0	21	6	2	0	6	0	0	6	2	580	1400	1540	1560	16790
OIL CHANGE AT 17052 MILES																					
01-26-88	17460	91.4	13.9	155	2.47	7.18	0.0	16	4	0	0	5	0	0	5	0	368	1080	990	1220	17197
OIL CHANGE TO PARAMINS 10W30 AT 17460 MI																					
05-11-88	18020	70.9	9.6	114	3.14	9.65	0.0	32	11	7	0	9	0	0	9	0	110	3220	1500	1730	17614
OIL CHANGE AT 18020 MILES																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
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VEHICLE USA #: CH0550 ENGINE TYPE: I-4 FORD ESCORT SADP METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
FORD ESCORT RECEIVED FROM CEC																					
NEW UNUSED 20W-40 MOTOR CRAFT OIL																					
03-06-87	8734	88.5	11.8	124	1.68	6.51	0.0	56	20	8	0	13	0	0	10	1	450	1230	1320	1360	15920
OIL CHANGE AT 8734 MILES																					
06-04-87	9863	96.4	11.6	109	2.69	7.29	0.0	47	15	4	0	9	0	0	9	0	700	1470	1750	1720	16152
OIL CHANGE AT 9863 MILES																					
09-23-87	12078	100.0	12.6	120	2.92	5.95	0.0	45	20	5	0	10	0	0	9	0	610	1530	1800	1690	16749
OIL CHANGE AT 12078 MILES																					
OIL CHANGE TO PARAMINS 10W30 AT 12335 MI																					
02-24-88	12401	68.4	8.9	103	3.09	10.30	0.0	19	7	3	0	2	0	0	5	2	100	2440	1400	1640	17332
05-16-88	12543	58.6	10.7	176	3.14	11.00	0.0	65	22	12	0	4	1	0	11	1	150	2650	1260	1580	17633
OIL CHANGE AT 12543 MILES																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
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VEHICLE USA #: CH0551 ENGINE TYPE: I-4 FORD ESCORT SADP METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
FORD ESCORT RECEIVED FROM CEC																					
NEW UNUSED 20W-40 MOTOR CRAFT OIL																					
03-14-87	17018	93.4	11.9	118	3.14	3.14	0.0	114	25	10	5	21	1	0	11	0	570	1440	1380	1770	15953
OIL CHANGE AT 17018 MILES																					
07-09-87	18194	98.9	13.1	130	2.36	5.95	0.0	54	12	4	0	10	0	0	8	0	620	1570	1600	1710	16421
OIL CHANGE AT 18194 MILES																					
10-16-87	19428	99.0	12.2	115	3.03	6.06	0.0	30	9	3	0	10	0	0	7	0	490	1420	1430	1590	16789
OIL CHANGE AT 19428 MILES																					
02-22-88	20355	85.3	13.9	168	1.68	5.72	0.0	47	13	7	0	8	0	0	8	0	370	1130	1260	1420	17324
OIL CHANGE TO PARAMINS 10W30 AT 20355 MI																					
07-11-88	21342	69.6	12.6	183	3.98	11.20	0.0	29	9	5	0	6	0	0	8	0	80	2500	1470	1490	17731
OIL CHANGE AT 21342 MILES																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
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VEHICLE USA #: CH0552 ENGINE TYPE: I-4 FORD ESCORT SADP METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
FORD ESCORT RECEIVED FROM CEC																					
NEW UNUSED 20W-40 MOTOR CRAFT OIL																					
03-06-87	14654	82.8	11.2	124	2.02	6.28	0.0	104	44	17	4	15	0	0	12	1	520	1310	1320	1410	15921
OIL CHANGE AT 14654 MILES																					
06-24-87	15183	87.4	11.5	121	1.51	5.39	0.0	34	13	9	0	7	0	0	8	2	480	1400	1470	1740	16239
OIL CHANGE AT 15183 MILES																					
10-02-87	15696	87.9	12.5	138	1.91	7.07	0.0	43	9	4	0	8	0	0	9	1	550	1470	1740	1630	16748
OIL CHANGE AT 15696 MILES																					
01-26-88	16031	64.9	12.7	200	1.57	5.05	0.0	20	8	3	0	6	0	0	6	1	0	670	1200	1040	17196
OIL CHANGE TO PARAMINS 10W30 AT 16031 MI																					
02-24-88	16146	62.5	9.0	120	2.81	11.60	0.0	20	9	4	0	4	0	0	0	1	100	2470	1330	1490	17334
05-10-88	16459	55.9	10.3	175	2.47	11.70	0.0	37	18	11	0	5	0	0	8	0	100	2760	1160	1510	17611
OIL CHANGE AT 16459 MILES																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
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VEHICLE USA #: CH0553 ENGINE TYPE: I-4 FORD ESCORT SADP METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
FORD ESCORT RECEIVED FROM CEC																					
NEW UNUSED 20W-40 MOTOR CRAFT OIL																					
02-20-87	9909	100.3	12.3	115	2.92	8.53	0.0	71	29	7	0	13	0	0	9	1	550	1390	1570	1520	15091
OIL CHANGE AT 9909 MILES																					
06-02-87	10866	97.8	13.3	135	2.81	6.62	0.0	42	13	5	0	9	0	0	8	0	630	1410	1690	1650	16150
OIL CHANGE AT 10866 MILES																					
09-23-87	13892	111.5	13.0	111	1.91	4.94	0.0	40	14	4	0	10	0	0	8	0	430	1210	1290	1420	16685
OIL CHANGE AT 13892 MILES																					
01-26-88	15592	96.9	12.6	125	2.81	5.50	0.0	66	16	6	0	12	0	0	11	0	430	1340	1020	1410	17198
OIL CHANGE TO PARAMINS 10W30 AT 15592 MI																					
04-27-88	16353	64.8	9.7	132	2.47	9.20	0.0	46	15	8	0	9	2	0	14	0	140	4710	1600	2230	17557
OIL CHANGE AT 16353 MILES																					
07-18-88	16836	72.5	9.6	111	3.65	12.60	0.0	19	7	7	0	5	1	0	6	1	60	3170	1360	1760	17852
OIL CHANGE AT 16836 MILES																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

VEHICLE USA #: CH0554 ENGINE TYPE: I-4 FORD ESCORT SADP METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
FORD ESCORT RECEIVED FROM CEC																					
NEW UNUSED 20W-40 MOTOR CRAFT OIL																					
02-23-87	14659	86.8	11.8	127	2.24	4.71	0.0	65	26	9	0	9	0	0	9	0	250	1020	1180	1270	15918
OIL CHANGE AT 14659 MILES																					
06-02-87	18102	104.0	12.5	113	5.05	7.52	0.0	60	16	5	0	11	0	0	12	0	870	1620	1670	1820	16151
OIL CHANGE AT 18102 MILES																					
09-16-87	20224	102.2	12.7	119	3.14	6.28	0.0	42	13	4	0	9	0	0	8	10	580	1030	1090	1380	16683
OIL CHANGE AT 20224 MILES																					
01-06-88	22159	93.8	14.8	165	2.81	4.83	0.0	39	9	4	0	9	0	0	8	0	290	940	1020	1220	17097
OIL CHANGE AT 22159 MILES																					
03-07-88	23221	94.6	12.1	120	2.64	6.06	0.0	35	10	6	0	11	0	0	7	0	410	1120	1270	1300	17392
OIL CHANGE TO PARAMINS 10W30 AT 23221																					
07-08-88	24089	74.4	10.6	129	2.75	8.75	0.0	42	12	4	0	5	0	0	7	0	120	2630	1550	1630	17801
OIL CHANGE AT 24089 MILES																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
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VEHICLE USA #: CH0555 ENGINE TYPE: I-4 FORD ESCORT SADP METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
FORD ESCORT RECEIVED FROM CEC																					
NEW UNUSED 20W-40 MOTOR CRAFT OIL																					
03-15-87	13493	90.5	11.1	109	2.36	2.02	0.0	167	59	28	6	23	1	0	14	0	430	1390	1210	1510	15955
OIL CHANGE AT 13493 MILES																					
07-09-87	14129	95.8	12.0	116	2.24	6.51	0.0	119	20	23	0	9	1	0	10	1	520	1420	1490	1620	16422
OIL CHANGE AT 14129 MILES																					
10-16-87	14801	89.2	11.5	118	2.81	6.28	0.0	90	11	8	0	10	0	0	8	1	510	1140	1460	1430	16700
OIL CHANGE AT 14801 MILES																					
03-01-88	15916	88.4	14.0	163	1.51	2.69	0.0	55	16	20	0	7	0	0	0	0	310	960	1250	1370	17325
OIL CHANGE TO PARAMINS 10W30 AT 15916 MI																					
OIL CHANGE AT 16074 MILES																					
07-11-88	16078	76.3	9.6	103	2.81	10.30	0.0	36	13	8	0	6	0	0	6	0	110	2330	1430	1470	17745

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
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VEHICLE USA #: CH0556 ENGINE TYPE: I-4 FORD ESCORT SADP METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL OIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
FORD ESCORT RECEIVED FROM CEC																					
NEW UNUSED 20W-40 MOTOR CRAFT OIL																					
03-06-87	14295	93.3	12.5	129	1.80	5.95	0.0	91	23	14	3	13	1	0	11	0	440	1350	1340	1460	15922
OIL CHANGE AT 14295 MILES																					
06-15-87	14849	91.8	15.4	178	1.18	7.63	0.0	28	28	7	0	5	0	0	7	0	500	1300	1530	1540	16217
OIL CHANGE AT 14849 MILES																					
08-26-87	18692	103.3	15.4	157	2.47	4.94	0.0	38	10	3	0	13	0	0	7	0	310	1050	1050	1270	16564
OIL CHANGE AT 18692 MILES																					
12-02-87	19564	81.7	11.3	128	2.02	6.73	0.0	35	9	4	0	12	1	0	0	0	560	1440	1460	1470	17039
OIL CHANGE AT 19564 MILES																					
OIL CHANGE TO PARAMINS 10W30 AT 19613 MI																					
02-24-88	20061	77.0	10.1	111	3.03	11.20	0.0	27	10	3	0	9	0	0	11	1	170	3260	1590	1770	17335
04-10-88	20498	73.5	9.5	107	2.58	11.90	0.0	27	7	3	0	7	0	0	7	0	90	3080	1270	1690	17608
OIL CHANGE AT 20498 MILES																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
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VEHICLE USA #: CH0557 ENGINE TYPE: I-4 FORD ESCORT SADP METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL OIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
FORD ESCORT RECEIVED FROM CEC																					
NEW UNUSED 20W-40 MOTOR CRAFT OIL																					
02-18-87	11130	87.4	11.8	127	1.85	3.92	0.0	114	39	18	4	18	1	0	16	0	660	1510	1460	1640	15890
OIL CHANGE AT 11130 MILES																					
05-01-87	13022	100.7	15.7	166	2.81	5.39	0.0	68	20	15	0	14	0	0	15	0	590	1300	1510	1540	16149
OIL CHANGE AT 13022 MILES																					
09-22-87	14503	92.6	12.3	127	2.24	4.94	0.0	40	9	5	0	10	0	0	9	0	380	980	1060	1190	16684
OIL CHANGE AT 14503 MILES																					
01-23-88	15387	90.3	11.6	118	2.92	6.73	0.0	27	5	3	0	6	0	0	7	0	310	1020	940	1130	17199
OIL CHANGE TO PARAMINS 10W30 AT 15387 MI																					
04-10-88	17608	85.2	10.1	98	3.82	8.64	0.0	41	15	12	0	12	0	0	11	1	130	3440	1490	1830	17609
OIL CHANGE AT 17608 MILES																					

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
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VEHICLE USA #: X79115 ENGINE TYPE: I-4 CHRYSLER K-CAR USAF METHANOL VEHICLE REVISION DATE: AUG 11, 1989

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
CHRYSLER CONVERTED "K" CAR																					
NEW UNUSED LUBRIZOL (AL-15427)																					
12-17-86	29245	63.1	8.8	113	2.69	8.75	0.0	32	12	21	7	13	0	0	99	80	20	2660	1360	1450	15682
02-09-87	29570	64.8	10.7	155	3.14	4.94	0.0	69	30	35	19	24	2	0	162	78	30	2720	1420	1540	15649
04-22-87	31742	68.9	9.9	126	2.58	8.08	0.0	105	42	40	22	48	2	0	156	39	30	2680	1530	1590	16027
05-15-87	32363	72.5	12.0	162	2.47	8.30	0.0	144	46	52	27	64	3	0	172	39	30	2950	1296	1770	16068
OIL CHANGE AT 32364 MILES																					
07-14-87	33083	71.2	10.3	130	2.81	5.50	0.0	62	29	17	0	37	1	0	55	59	30	3200	1430	1690	16424
09-02-87	35621	77.1	13.0	171	1.80	7.18	0.0	89	50	28	4	70	2	0	68	0	30	3150	1360	1890	16578
OIL CHANGE AT 35621 MILES																					
10-02-87	36523	64.8	10.4	150	2.36	10.40	0.0	30	22	8	0	24	0	0	20	71	30	2990	1610	1640	16751
01-15-88	38648	71.1	11.1	141	3.70	8.98	0.0	54	24	14	0	68	0	0	27	38	20	3120	1070	1630	17190
OIL CHANGE AT 38650 MILES																					
02-16-88	39368	65.6	10.5	149	2.58	10.30	0.0	36	15	9	0	30	0	0	12	59	30	2890	1240	1650	17323
05-04-88	41850	74.0	11.4	147	4.26	3.93	0.0	86	53	18	0	104	2	0	20	67	40	6150	1420	2680	17584
OIL CHANGE AT 41850 MILES																					
06-09-88	42812	67.4	10.4	141	6.73	8.64	0.0	42	9	7	0	46	1	0	8	83	20	3090	1560	1620	17732
07-06-88	43412	72.9	11.3	147	3.37	9.31	0.0	103	23	17	0	152	4	0	22	88	50	3920	1590	2550	18109

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
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VEHICLE USA #: X79116 ENGINE TYPE: I-4 CHRYSLER K-CAR USAF METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL DIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	BFLRF CODE
CHRYSLER CONVERTED "K" CAR																					
NEW UNUSED LUBRIZOL (AL-15427)																					
12-17-86	29808	62.3	10.9	168	2.92	8.98	0.0	15	14	8	5	10	0	0	106	95	30	2960	1530	1570	15679
02-09-87	30183	65.6	9.7	130	3.03	9.54	0.0	53	38	23	17	22	0	0	191	75	40	3040	1540	1660	15840
04-02-87	31242	63.4	10.4	153	2.58	11.33	0.0	105	46	27	25	27	1	0	182	58	40	2780	1210	1620	15986
OIL CHANGE AT 31243 MILES																					
04-03-87	31250	64.5	10.0	140	2.69	8.98	0.0	21	5	3	0	6	0	0	36	90	30	3030	1270	1710	15987
04-15-87	31844	66.2	10.5	147	2.24	7.97	0.0	26	16	7	0	11	0	0	75	83	30	3160	1370	1690	16008
07-27-87	33861	68.0	10.2	135	3.59	8.30	0.0	51	37	18	3	35	2	0	105	41	30	2820	1100	1590	16459
OIL CHANGE AT 33861 MILES																					
11-10-87	36077	74.6	11.1	139	2.58	13.92	0.0	47	25	16	0	48	0	0	48	51	40	3250	1470	1750	16847
OIL CHANGE AT 36077 MILES																					
02-29-88	39885	74.8	11.0	137	1.80	3.62	0.0	105	46	27	25	27	1	0	182	58	40	2780	1210	1620	17322
OIL CHANGE AT 39885 MILES																					
03-04-88	40774	66.5	13.2	204	2.52	8.98	0.0	16	10	4	0	25	0	0	0	52	20	2320	1160	1280	17393
07-08-88	42902	76.3	11.4	141	4.88	6.51	0.0	85	44	14	0	25	0	0	27	47	30	3760	1610	2000	17804
OIL CHANGE AT 42902 MILES																					
07-08-88	43100	66.7	10.5	146	2.36	5.05	0.0	32	12	7	0	50	2	0	19	109	60	3700	1570	2570	18110

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

VEHICLE USA #: X79117 ENGINE TYPE: I-4 CHRYSLER K-CAR USAF METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	100 C	VI	TAN	TBN D664	FUEL OIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	SFLRF CODE
CHRYSLER CONVERTED "K" CAR																					
NEW UNUSED LUBRIZOL (AL-15427)																					
12-17-86	29540	63.7	10.4	152	2.47	9.64	0.0	26	23	35	7	11	0	0	142	96	20	3130	1510	1610	15680
02-09-87	30674	70.2	10.5	136	2.92	9.54	0.0	45	58	54	19	22	2	0	184	72	30	3060	1350	1730	15950
04-16-87	32550	72.7	11.3	148	2.36	7.97	0.0	105	69	65	31	41	3	0	205	41	40	3100	1230	1800	16009
05-12-87	32874	75.6	10.7	128	2.02	7.86	0.0	116	79	61	33	51	3	0	223	37	40	3040	1200	1810	16067
OIL CHANGE AT 32875 MILES																					
09-14-87	36321	73.6	10.9	137	1.91	6.73	0.0	51	36	34	0	49	0	0	69	40	20	2570	1200	1510	16664
OIL CHANGE AT 36321 MILES																					
OIL CHANGE AT 39411 MILES																					
01-05-88	39413	72.6	10.9	139	2.24	9.88	0.0	55	31	24	0	84	0	0	35	25	20	2860	980	1540	17086
05-09-88	42692	70.9	11.2	150	2.24	4.60	0.0	93	53	21	4	144	2	0	28	39	30	4540	1270	2140	17599
OIL CHANGE AT 42692 MILES																					
06-17-88	43200	67.6	10.9	152	6.73	7.97	0.0	85	33	14	0	149	1	0	19	73	30	3460	1540	1820	17802
07-08-88	43823	72.2	11.2	147	2.19	5.14	0.0	148	44	21	7	372	4	0	30	66	50	3660	1460	2380	18111

LUBRICANT DATA AND TRACE METALS FROM
U.S. ARMY METHANOL-FUELED ADMINISTRATIVE
VEHICLE DEMONSTRATION PROGRAM - PHASE II

VEHICLE USA #: X79118 ENGINE TYPE: I-4 CHRYSLER K-CAR USAF METHANOL VEHICLE REVISION DATE: AUG 11, 1988

DATE	ODOM	VISCOSITY 40 C	VISCOSITY 100 C	VI	TAN	TBN D664	FUEL OIL %	PPM (PARTS PER MILLION) Fe	Pb	Cu	Sn	Al	Ni	Mn	Si	B	Mg	Ca	P	Zn	DFLRF CODE
CHRYSLER CONVERTED "K" CAR																					
NEW UNUSED LUBRIZOL (AL-15427)																					
12-17-86	30328	59.1	9.4	140	0.00	0.00	0.0	26	11	15	3	7	0	0	111	75	20	2530	1360	1370	15681
02-23-87	31669	66.9	9.7	126	2.92	9.88	0.0	50	46	31	16	24	2	0	106	70	40	2790	1480	1570	15894
04-13-87	33295	73.1	11.0	140	2.19	7.63	0.0	77	54	36	19	41	3	0	132	44	40	3350	1330	1850	16006
OIL CHANGE AT 33295 MILES																					
04-14-87	33296	69.8	10.7	142	3.82	2.50	0.0	14	7	5	0	7	0	0	22	92	30	3290	1410	1620	16007
08-31-87	36394	74.7	15.1	214	2.13	7.18	0.0	57	34	18	2	40	0	0	56	34	20	2290	1170	1270	16566
OIL CHANGE AT 36394 MILES																					
OIL CHANGE AT 39496 MILES																					
12-21-87	39596	73.1	10.9	138	2.47	9.54	0.0	36	27	15	0	57	0	0	23	20	20	2200	870	1320	17085
01-22-88	40286	67.2	10.4	142	2.74	11.30	0.0	25	16	7	0	41	1	0	15	51	20	2800	950	1430	17192
04-18-88	42542	60.5	11.8	169	2.69	9.54	0.0	60	67	20	5	120	2	0	29	53	40	4640	1350	2200	17554
OIL CHANGE AT 42542 MILES																					
05-18-88	43593	69.5	10.8	145	4.49	7.63	0.0	56	22	9	0	96	2	0	15	65	20	3380	1300	1640	17636
07-08-88	44802	72.9	11.6	153	2.36	6.28	0.0	147	39	23	0	185	5	0	23	28	30	3970	980	2058	18112

APPENDIX F

ENGINE WEAR MEASUREMENTS WITH MANUFACTURER'S PRODUCTION SPECIFICATIONS

U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION TEST PROGRAM

		Fuel	Miles
Engine Type:	GM 2.5L, L-4	Unleaded	17,762
Vehicle No.:	CM 3613	M-85	45,151
Vehicle Type:	Chevrolet Citation	Total	62,913
Location:	Presidio of San Francisco, California		

Engine Wear Measurements[a]

	Cylinder Number							
	1		2		3		4	
Compression Ring Gaps								
Top	0.034		0.030		0.031		0.030	
Bottom	0.028		0.028		0.029		0.030	
Cylinder Bore Diameter	L*	T	L	T	L	T	L	T
Top	4.0025	4.0035	4.0019	4.0038	4.3029	4.0040	4.0031	4.0034
Middle	4.0023	4.0019	4.0026	4.0019	4.0032	4.0021	4.0022	4.0023
Bottom	4.0010	4.0019	4.0016	4.0012	4.0022	4.0016	4.0010	4.0022
Out of Round	0.0010		0.0019		0.0011		0.0003	
Taper	0.0015		-0.0003		0.0007		0.0021	
Camshaft Lobe Height	I	E	I	E	I	E	I	E
	0.229	0.228	0.229	0.226	0.228	0.228	0.229	0.228
Valve Stem to Guide Clearance								
Top	0.0030	0.0028	0.0031	0.0021	0.0026	0.0025	0.0027	0.0019
Bottom		0.0030		0.0037		0.0036		0.0033
Connecting Rod Bearings Plastigage Clearance	0.0020		0.0020		0.0018		0.0018	
End of Test Compression Pressure (psig)	145		145		135		145	

Crankshaft Main Bearings Plastigage Clearance	1	2	3	4	5
	0.0020	0.0020	0.0021	0.0017	0.0025

End of Test Blow-By Rate	RPM	Oil Pressure, psi	Flow Rate, cfm	Pressure, in.
	800	Not taken	0.180	1.2
	1800	Not taken	0.165	1.4

Manufacturer's Production Specifications

Compression Ring Gaps	
Top	0.010 - 0.022
Bottom	0.010 - 0.027
Cylinder Bore Diameter	
Out of Round	0.0014
Taper	0.0005
Camshaft Lobe Height	
Intake/Exhaust	0.227
Valve Stem to Guide Clearance	
Intake	0.0010 - 0.0027
Exhaust	
Top	0.0010 - 0.0027
Bottom	0.0020 - 0.0037
Connecting Rod Bearings Clearance	0.0005 - 0.0026
Crankshaft Main Bearings Clearance	0.0005 - 0.0022

a = All measurements are in inches
* = L = Longitudinal; T = Transversal
I = Intake; E = Exhaust

U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION TEST PROGRAM

Engine Type:	GM 2.8L, V-6
Vehicle No.:	CM 3614
Vehicle Type:	Chevrolet Citation
Location:	Presidio of San Francisco, California

Fuel	Miles
Unleaded Gasoline	18,441
M-85	45,569
Total	64,010

	1		2		3		4		5		6	
Compression Ring Gaps												
Top	0.035		0.036		0.029		0.030		0.028		0.024	
Bottom	0.025		0.027		0.025		0.025		0.025		0.025	
Cylinder Bore Diameter	L*	T	L	T	L	T	L	T	L	T	L	T
Top	3.5052	3.5070	35054	3.5075	3.5058	3.5072	3.5043	3.5090	3.5052	3.5060	315051	3.5087
Middle	3.5045	3.5060	3.5045	3.5061	3.5047	3.5062	3.5046	3.5042	3.5046	3.5057	3.5045	3.5043
Bottom	3.5041	3.5058	3.5044	3.5060	3.5043	3.5060	3.5050	3.5046	3.5045	3.5057	3.5051	3.5048
Out of Round	0.0018		0.0021		0.0014		0.0047		0.0008		0.0036	
Taper	0.0011		0.0010		0.0015		0.0007		0.0007		0.0000	
	I	E	I	E	I	E	I	E	I	E	I	E
Camshaft Lobe Height	0.228	0.259	0.227	0.260	0.230	0.260	0.230	0.240	0.229	0.261	0.228	0.262
Valve Stem to Guide Clearance	0.0030	0.0035	0.0030	0.0030	0.0018	0.0055	0.0030	0.0050	0.0030	0.0035	0.0030	0.0035
Connecting Rod Bearings Plastigage Clearance	0.0020		0.0017		0.0025		0.0025		0.0025		0.0020	

Crankshaft Main Bearings Plastigage Clearance	1	2	3	4
	0.0020	0.0020	0.0020	0.0030

	1	2	3	4	5	6
End of Test Compression Pressure (psig)	165	160	180	140	180	155

End of Test Blow-By Rate	RPM	Oil Pressure, psi	Flow Rate, cfm	Pressure, in.
	800	35	0.150	0.3
	1800	50	0.185	1.0

Manufacturer's Production Specifications

Compression Ring Gaps	
Top/Bottom	0.010 - 0.020
Cylinder Bore Diameter	3.5050 ± 0.0015
Out of Round	0.0008
Taper	0.0008
Camshaft Lobe Height	
Intake	0.231
Exhaust	0.263
Valve Stem to Guide Clearance	
Intake/Exhaust	0.0010 - 0.0027
Connecting Rod Bearings	
Clearance	0.0014 - 0.0037
Crankshaft Main Bearings	
Clearance	0.0016 - 0.0032

a = All measurements are in inches
* = L = Longitudinal; T = Transversal
I = Intake; E = Exhaust

U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION TEST PROGRAM

		Fuel	Miles
Engine Type:	GM 2.5L, L-4	Unleaded	16,185
Vehicle No.:	GM 3615	M-85	25,120
Vehicle Type:	Chevrolet Citation	Total	41,305
Location:	Presidio of San Francisco, California		

Engine Wear Measurements[a]

Cylinder Number

	1		2		3		4	
Compression Ring Gaps								
Top	0.029		0.028		0.026		0.029	
Bottom	0.036		0.035		0.033		0.038	
Cylinder Bore Diameter	L*	T	L	T	L	T	L	T
Top	4.0020	4.0025	4.0030	4.0025	4.0019	4.0012	4.0021	4.0030
Middle	4.0019	4.0027	4.0023	4.0032	4.0018	4.0022	4.0022	4.0030
Bottom	4.0017	4.0020	4.0018	4.0024	4.0010	4.0016	4.0024	4.0018
Out of Round	0.0005		0.0005		0.0007		0.0009	
Taper	0.0003		0.0013		0.0009		0.0093	
	I	E	I	E	I	E	I	E
Camshaft Lobe Height	0.230	0.230	0.232	0.232	0.241	0.230	0.231	0.230
Valve Stem to Guide Clearance								
Top	0.0025	NT	0.0026	NT	0.0023	NT	0.0025	N.T.
Bottom		0.0031		0.0032		0.0031		0.0033
Connecting Rod Bearings Plastigage Clearance	0.0038		0.0028		0.0029		0.0032	
End of Test Compression Pressure (psig)	NT		NT		NT		NT	

Crankshaft Main Bearings Plastigage Clearance	1	2	3	4	5
	0.0028	0.0023	0.0024	0.0023	0.0027

End of Test Blow-By Rate	RPM	Oil Pressure, psi	Flow Rate, cfm	Pressure, in.
	NT	NT	NT	NT

Manufacturer's Production Specifications

Compression Ring Gaps	
Top	0.010 - 0.022
Bottom	0.010 - 0.027
Cylinder Bore Diameter	
Out of Round	0.0014
Taper	0.0005
Camshaft Lobe Height	
Intake/Exhaust	0.227
Valve Stem to Guide Clearance	
Intake	0.0010 - 0.0027
Exhaust	
Top	0.0010 - 0.0027
Bottom	0.0020 - 0.0037
Connecting Rod Bearings Clearance	0.0005 - 0.0026
Crankshaft Main Bearings Clearance	0.0005 - 0.0022

a = All measurements are in inches
* = L = Longitudinal; T = Transversal
I = Intake; E = Exhaust; NT = Not taken

U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION TEST PROGRAM

Engine Type:	GM 2.8L, V-6	Fuel	Miles
Vehicle No.:	GM 3616	Unleaded Gasoline	28,257
Vehicle Type:	Chevrolet Citation	M-85	30,613
Location:	Presidio of San Francisco, California	Total	58,870

Engine Wear Measurements[a]

Cylinder Number

	1		2		3		4		5		6	
Compression Ring Gaps												
Top	0.036		0.031		0.022		0.026		Broken		0.021	
Bottom	0.019		0.022		0.024		0.022		0.022		0.022	
Cylinder Bore Diameter	L*	T	L	T	L	T	L	T	L	T	L	T
Top	3.5074	3.5077	3.5074	3.5097	3.5063	3.5077	3.5086	3.5073	3.5058	3.5068	3.5054	3.5068
Middle	3.5049	3.5057	3.5053	3.5057	3.5053	3.5060	3.5056	3.5057	3.5052	3.5057	3.5046	3.5057
Bottom	3.5045	3.5057	3.5050	3.5056	3.5048	3.5059	3.5052	3.5057	3.5050	3.5057	3.5043	3.5057
Out of Round	0.0003		0.0023		0.0014		0.0007		0.0010		0.0014	
Taper	0.0029		0.0024		0.0015		0.0014		0.0008		0.0011	
	I	E	I	E	I	E	I	E	I	E	I	E
Camshaft Lobe Height	0.231	0.250	0.230	0.253	0.229	0.260	0.231	0.258	0.227	0.252	0.223	0.256
Valve Stem to Guide Clearance	0.0030	0.0030	0.0030	0.0040	0.0030	0.0040	0.0040	0.0040	0.0030	0.0040	0.0030	0.0040
Connecting Rod Bearings Plastigage Clearance	0.0030		0.0050		0.0020		0.0020		0.0020		0.0015	

Crankshaft Main bearings Plastigage Clearance	1	2	3	4
	0.0030	0.0030	0.0030	0.0030

End of Test Compression Pressure (psig)	1	2	3	4	5	6
	155	155	150	160	130	160

End of Test Blow-By Rate	RPM	Oil Pressure, psi	Flow Rate, cfm	Pressure, in.
	800	Not taken	0.300	1.6
	1800	Not taken	0.375	2.2

Manufacturer's Production Specifications

Compression Ring Gaps	
Top/Bottom	0.010 - 0.020
Cylinder Bore Diameter	3.5050 ± 0.0015
Out of Round	0.0008
Taper	0.0008
Camshaft Lobe Height	
Intake	0.231
Exhaust	0.263
Valve Stem to Guide Clearance	
Intake, Exhaust	0.0010 - 0.0027
Connecting Rod Bearings	
Clearance	0.0014 - 0.0037
Crankshaft Main Bearings	
Clearance	0.0016 - 0.0032

a = All measurements are in inches
* = L = Longitudinal; T = Transversal
I = Intake; E = Exhaust

U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION TEST PROGRAM

		Fuel	Miles
Engine Type:	GM 2.5L, L-4	Unleaded	4,908
Vehicle No.:	CM 2879	M-85	12,295
Vehicle Type:	Chevrolet S-10 PU	Total	17,203
Location:	Fort Ord, California		

Engine Wear Measurements[a]

Cylinder Number

	1		2		3		4	
Compression Ring Gaps								
Top	0.020		0.017		0.019		0.019	
Bottom	0.022		0.025		0.021		0.022	
Cylinder Bore Diameter	L*	T	L	T	L	T	L	T
Top	4.0019	4.0009	4.0016	4.0018	4.0014	4.0014	4.0019	4.0010
Middle	4.0018	4.0015	4.0016	4.0013	4.0017	4.0013	4.0015	4.0013
Bottom	4.0010	4.0021	4.0016	4.0013	4.0019	4.0009	4.0002	4.0018
Out of Round	0.0010		0.0002		0.0000		0.0009	
Taper	0.0009		0.0000		0.0005		0.0017	
	I	E	I	E	I	E	I	E
Camshaft Lobe Height	0.229	0.230	0.230	0.230	0.228	0.227	0.230	0.230
Valve Stem to Guide Clearance								
Top	0.0017	0.0026	0.0021	0.0023	0.0020	0.0020	0.0021	0.0024
Bottom		0.0028		0.0029		0.0031		0.0028
Connecting Rod Bearing Plastigage Clearance	0.0020		0.0020		0.0020		0.0020	
End of Test Compression Pressure (psig)	143		148		148		142	

Crankshaft Main Bearings	1	2	3	4	5
Plastigage Clearance	0.0020	0.0020	0.0020	0.0020	0.0020

End of Test Blow-By Rate	RPM	Oil Pressure, psi	Flow Rate, cfm	Pressure, in.
	800	30	0.198	0.1
	1800	34	0.199	0.1

Manufacturer's Production Specifications

Compression Rings Gaps	
Top	0.010 - 0.022
Bottom	0.010 - 0.027
Cylinder Bore Diameter	
Out of Round	0.0014
Taper	0.0005
Camshaft Lobe Height	
Intake/Exhaust	0.227
Valve Stem to Guide Clearance	
Intake	0.0010 - 0.0027
Exhaust	
Top	0.0010 - 0.0027
Bottom	0.0020 - 0.0037
Connecting Rod Bearings Clearance	0.0005 - 0.0026
Crankshaft Main Bearings Clearance	0.0005 - 0.0022

a = All measurements are in inches
* = L = Longitudinal; T = Transversal
I = Intake; E = Exhaust

U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION TEST PROGRAM

		Fuel	Miles
Engine Type:	GM 2.5L, L-4	Unleaded	6,090
Vehicle No:	GM 2883	M-85	8,662
Vehicle Type:	Chevrolet S-10 PU	Total	14,752
Location:	Fort Ord, California		

Engine Wear Measurements[a]

Cylinder Number

	1		2		3		4	
Compression Ring Gap:								
Top	0.021		0.020		0.012		0.018	
Bottom	0.025		0.025		0.025		0.026	
Cylinder Bore Diameter	L*	T	L	T	L	T	L	T
Top	4.0016	4.0016	4.0016	4.0014	4.0018	4.0016	4.0016	4.0010
Middle	4.0016	4.0017	4.0011	4.0015	4.0013	4.0017	4.0016	4.0017
Bottom	4.0006	4.0016	4.0010	4.0015	4.0018	4.0014	4.0005	4.0020
Out of Round	0.0000		0.0002		0.0002		0.0006	
Taper	0.0010		0.0006		0.0000		0.0010	
	I	E	I	E	I	E	I	E
Camshaft Lobe Height	0.229	0.230	0.229	0.230	0.228	0.230	0.229	0.229
Valve Stem to Guide Clearance								
Top	0.0019	0.0024	0.0024	0.0028	0.0022	0.0020	0.0021	0.0027
Bottom		0.0034		0.0034		0.0030		0.0037
Connecting Rod Bearings Plastigage Clearance	0.0015		0.0020		0.0020		0.0020	
End of Test Compression Pressure (psig)	145		140		150		145	

Crankshaft Main Bearings Plastigage Clearance	1	2	3	4	5
	0.0020	0.0015	0.0015	0.0015	0.0020

End of Test Blow-By Rate	RPM	Oil Pressure, psi	Flow Rate, cfm	Pressure, in.
	800	32	0.395	0.2
	1800	34	0.280	0.2

Manufacturer's Production Specifications

Compression Ring Gaps	
Top	0.010 - 0.022
Bottom	0.010 - 0.027
Cylinder Bore Diameter	
Out of Round	0.0014
Taper	0.0005
Camshaft Lobe Height	
Intake/Exhaust	0.227
Valve Stem to Guide Clearance	
Intake	0.0010 - 0.0027
Exhaust	
Top	0.0010 - 0.0027
Bottom	0.0020 - 0.0037
Connecting Rod Bearings Clearance	0.0005 - 0.0026
Crankshaft Main Bearings Clearance	0.0005 - 0.0022

a = All measurements are in inches
* = L = Longitudinal; T = Transversal
I = Intake; E = Exhaust

U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE
DEMONSTRATION TEST PROGRAM

		Fuel	Miles
Engine Type:	GM 2.8L, V-6	Unleaded Gasoline	15,595
Vehicle No.:	GM 2884	M-85	0
Vehicle Type:	Chevrolet S-10 PU	Total	15,595
Location:	Fort Ord, California		

Engine Wear Measurements[a]

Cylinder Number

	1		2		3		4		5		6	
Compression Ring Gaps												
Top	0.022		0.020		0.020		0.018		0.018		0.020	
Bottom	Broken		0.022		0.022		0.019		0.025		0.022	
Cylinder Bore Diameter	L*	T	L	T	L	T	L	T	L	T	L	T
Top	3.5063	3.5056	3.5058	3.5054	3.5060	3.5059	3.5050	3.5053	3.5051	3.5057	3.5050	3.5059
Middle	3.5049	3.5057	3.5047	3.5056	3.5048	3.5059	3.5045	3.5053	3.5041	3.5057	3.5040	3.5060
Bottom	3.5041	3.5063	3.5047	3.5059	3.5046	3.5063	3.5047	3.5059	3.5041	3.5058	3.5039	3.5063
Out of Round	0.0007		0.0004		0.0001		0.0003		0.0006		0.0009	
Taper	0.0019		0.0011		0.0014		0.0003		0.0010		0.0011	
	I	E	I	E	I	E	I	E	I	E	I	E
Camshaft Lobe Height	0.233	0.226	0.234	0.275	0.230	0.262	0.248	0.269	0.225	0.260	0.242	0.260
Valve Stem to Guide Clearance	0.0030	0.0055	0.0040	0.0070	0.0030	0.0055	0.0030	0.0045	0.0030	0.0055	0.0030	0.0055
Connecting Rod Bearings Plastigage Clearance	0.0020		0.0015		0.0020		0.0015		0.0020		0.0015	

Crankshaft Main Bearings Plastigage Clearance	1	2	3	4
	0.0030	0.0020	0.0025	0.0020

End of Test Compression Pressure (psig)	130	135	130	147	130	135

End of Test Blow-By Rate	RPM	Oil Pressure, psi	Flow Rate, cfm	Pressure, in.
	800	43	0.365	0.2
	1800	49	0.370	0.3

Manufacturer's Production Specifications

Compression Ring Gaps Top/Bottom	0.010-0.020
Cylinder Bore Diameter	3.5050 ± 0.0015
Out of Round	0.0008
Taper	0.0008
Camshaft Lobe Height	
Intake	0.231
Exhaust	0.263
Valve Stem to Guide Clearance Intake/Exhaust	0.0010 - 0.0027
Connecting Rod Bearings Clearance	0.0014 - 0.0037
Crankshaft Main Bearings Clearance	0.0016 - 0.0032

a = All measurements are in inches
* = L = Longitudinal; T = Transversal
I = Intake; E = Exhaust

U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION TEST PROGRAM

Engine Type:	GM 2.8L, V-6
Vehicle No.:	GM 2885
Vehicle Type:	Chevrolet S-10 PU
Location:	Fort Ord, California

Fuel	Miles
Unleaded Gasoline	18,147
M-85	0
Total	18,147

Engine Wear Measurements[a]

Cylinder Number

	1		2		3		4		5		6	
Compression Ring Gaps												
Top	0.018		0.016		0.016		0.016		0.017		0.021	
Bottom	0.019		0.017		0.015		0.015		0.017		0.018	
Cylinder Bore Diameter	L*	T	L	T	L	T	L	T	L	T	L	T
Top	3.5049	3.5054	3.5054	3.5060	3.5057	3.5060	3.5054	3.5056	3.5062	3.5069	3.5049	3.5059
Middle	3.5044	3.5054	3.5053	3.5059	3.5054	3.5061	3.5053	3.5056	3.5059	3.5069	3.5048	3.5060
Bottom	3.5042	3.5055	3.5055	3.5056	3.5057	3.5064	3.5054	3.5053	3.5061	3.5071	3.5050	3.5062
Out of Round	0.0005		0.0006		0.0003		0.0002		0.0007		0.0010	
Taper	0.0007		0.0001		0.0000		0.0000		0.0001		0.0001	
	I	E	I	E	I	E	I	E	I	E	I	E
Camshaft Lobe Height	0.221	0.259	0.226	0.262	0.217	0.263	0.230	0.263	0.226	0.254	0.236	0.255
Valve Stem to Guide Clearance	0.0030	0.0035	0.0025	0.0030	0.0020	0.0035	0.0025	0.0035	0.0025	0.0035	0.0030	0.0035
Connecting Rod Bearings Plastigage Clearance	0.0020		0.0020		0.0020		0.0025		0.0020		0.0020	

Crankshaft Main Bearings Plastigage Clearance	1	2	3	4
	0.0030	0.0030	0.0030	0.0030

End of Test Compression Pressure (psig)	1	2	3	4	5	6
	170	165	170	170	170	170

End of Test Blow-By Rate	RPM	Oil Pressure, psi	Flow Rate, cfm	Pressure, in.
	800	54	0.430	0.2
	1800	56	0.525	0.2

Manufacturer's Production Specifications

Compression Ring Gaps	
Top/Bottom	0.010 - 0.020
Cylinder Bore Diameter	3.5050 ± 0.0015
Out of Round	0.0008
Taper	0.0008
Camshaft Lobe Height	
Intake	0.231
Exhaust	0.263
Valve Stem to Guide Clearance	
Intake/Exhaust	0.0010 - 0.0027
Connecting Rod Bearings	
Clearance	0.0014 - 0.0037
Crankshaft Main Bearings	
Clearance	0.0016 - 0.0032

a = All measurements are in inches
* = L = Longitudinal; T = Transversal
I = Intake; E = Exhaust

U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION TEST PROGRAM

Engine Type:	GM 2.8L, V-6	Fuel	Miles
Vehicle No.	CM 2889	Unleaded Gasoline	6,526
Vehicle Type:	Chevrolet S-10 PU	M-85	10,905
Location:	Fort Ord, California	Total	17,431

Engine Wear Measurements[a]

Cylinder Number

	1		2		3		4		5		6	
Compression Ring Gaps												
Top	0.023		0.025		0.026		0.023		0.023		0.023	
Bottom	0.022		0.022		0.022		0.026		0.022		0.023	
Cylinder Bore Diameter	L*	T	L	T	L	T	L	T	L	T	L	T
Top	3.5065	3.5060	3.5050	3.5049	3.5059	3.5063	3.5056	3.5057	3.5055	3.5057	3.5056	3.5057
Middle	3.5055	3.5058	3.5043	3.5048	3.5053	3.5060	3.5051	3.5055	3.5048	3.5054	3.5050	3.5057
Bottom	3.5051	3.5059	3.5043	3.5048	3.5052	3.5059	3.5050	3.5054	3.5048	3.5054	3.5048	3.5058
Out of Round	0.0005		0.0001		0.0004		0.0001		0.0002		0.0001	
Taper	0.0014		0.0007		0.0007		0.0006		0.0007		0.0008	
	I	E	I	E	I	E	I	E	I	E	I	E
Camshaft Lobe Height	0.231	0.255	0.229	0.256	0.236	0.262	0.228	0.261	0.229	0.271	0.225	0.256
Valve Stem to Guide Clearance	0.0030	0.0040	0.0030	0.0025	0.0030	0.0035	0.0030	0.0030	0.0030	0.0035	0.0035	0.0020
Connecting Rod Bearings Plastigage Clearing	0.0030		0.0030		0.0020		0.0020		0.0030		0.0030	

Crankshaft Main Bearings Plastigage Clearance	1	2	3	4
	0.0025	0.0025	0.0025	0.0030

End of Test Compression Pressure (psig)						
	125	123	121.5	124	120	123

End of Test Blow-By Rate	RPM	Oil Pressure, psi	Flow Rate, cfm	Pressure, in.
	800	32	0.36	Not taken
	1800	43	0.40	Not taken

Manufacturer's Production Specifications

Compression Ring Gaps	
Top/Bottom	0.010 - 0.020
Cylinder Bore Diameter	3.5050 ± 0.0015
Out of Round	0.0008
Taper	0.0008
Camshaft Lobe Height	
Intake	0.231
Exhaust	0.263
Valve Stem to Guide Clearance	
Intake/Exhaust	0.0010 - 0.0027
Connecting Rod Bearings	
Clearance	0.0014 - 0.0037
Crankshaft Main Bearings	
Clearance	0.0016 - 0.0032

a = All measurements are in inches
* = L = Longitudinal; T = Transversal
I = Intake; E = Exhaust

U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION TEST PROGRAM

Engine Type:	GM 2.5L, L-4
Vehicle No.:	GM 2890
Vehicle Type:	Chevrolet S-10, PU
Location:	Fort Ord, California

Fuel	Miles
Unleaded	18,725
M-85	0
Total	18,725

Engine Wear Measurements[a]

	Cylinder Number 1		2		3		4	
Compression Ring Gaps								
Top	0.014		0.014		0.014		0.013	
Bottom	0.022		0.020		0.021		0.019	
Cylinder Bore Diameter	L*	T	L	T	L	T	L	T
Top	4.0016	4.0007	4.0022	4.0015	4.0017	4.0019	4.0019	4.0010
Middle	4.0014	4.0014	4.0022	4.0018	4.0018	4.0015	4.0015	4.0019
Bottom	4.0007	4.0019	4.0021	4.0018	4.0020	4.0012	4.0002	4.0020
Out of Round	0.0009		0.0007		0.0002		0.0009	
Taper	0.0009		0.0001		0.0003		0.0017	
	I	E	I	E	I	E	I	E
Camshaft Lobe Height	0.229	0.230	0.229	0.226	0.220	0.228	0.229	0.230
Valve Stem to Guide Clearance								
Top	0.0017	0.0026	0.0015	0.0026	0.0015	0.0026	0.0015	0.0023
Bottom		0.0030		0.0030		0.0029		0.0029
Connecting Rod Bearings Plastigage Clearance	0.0015		0.0020		0.0020		0.0015	
End of Test Compression Pressure (psig)	145		150		145		130	

Crankshaft Main Bearings Plastigage Clearance	1	2	3	4	5
	0.0030	0.0015	0.0015	0.0015	0.0015

End of Test Blow-By Rate	RPM	Oil Pressure, psi	Flow Rate, cfm	Pressure, in.
	800	34	0.335	0.1
	1800	39	0.215	0.1

Manufacturer's Production Specifications

Compression Ring Gaps	
Top	0.010 - 0.022
Bottom	0.010 - 0.027
Cylinder Bore Diameter	
Out of Round	0.0014
Taper	0.0005
Camshaft Lobe Height	
Intake/Exhaust	0.227
Valve Stem to Guide Clearance	
Intake	0.0010 - 0.0027
Exhaust	
Top	0.0010 - 0.0027
Bottom	0.0020 - 0.0037
Connecting Rod Bearings Clearance	0.0005 - 0.0026
Crankshaft Main Bearings Clearance	0.0005 - 0.0022

a = All measurements are in inches
* = L = Longitudinal; T = Transversal
I = Intake; E = Exhaust

U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION TEST PROGRAM

Engine Type:	GM 2.8L, V-6
Vehicle No.	GM 2895
Vehicle Type:	Chevrolet S-10 PU
Location:	Fort Ord, California

Fuel	Miles
Unleaded Gasoline	6,475
M-85	17,786
Total	24,261

Engine Wear Measurements[a]

	Cylinder Number											
	1		2		3		4		5		6	
Compression Ring Gaps												
Top	0.023		0.026		Broken		0.025		0.022		0.024	
Bottom	0.025		0.024		0.022		0.023		0.024		0.025	
Cylinder Bore Diameter	L*	T	L	T	L	T	L	T	L	T	L	T
Top	3.5053	3.5057	3.5051	3.5054	3.5044	3.5056	3.5048	3.5054	3.5047	3.5055	3.5044	3.5058
Middle	3.5043	3.5057	3.5043	3.5052	3.5044	3.5056	3.5043	3.5052	3.5040	3.5053	3.5037	3.5055
Bottom	3.5042	3.5059	3.5042	3.5053	3.5044	3.5056	3.5044	3.5053	3.5041	3.5053	3.5036	3.5057
Out of Round	0.0004		0.0003		0.0012		0.0006		0.0008		0.0014	
Taper	0.0011		0.0009		0.0000		0.0004		0.0006		0.0008	
	I	E	I	E	I	E	I	E	I	E	I	E
Camshaft Lobe Height	0.237	0.256	0.227	0.260	0.230	0.262	0.230	0.252	0.228	0.267	0.224	0.258
Valve Stem to Guide Clearance	0.0030	0.0050	0.0030	0.0060	0.0030	0.0050	0.0030	0.0050	0.0030	0.0030	0.0040	0.0050
Connecting Rod Bearings Plastigage Clearance	0.0017		0.0020		0.0020		0.0020		0.0015		0.0015	

Crankshaft Main Bearings Plastigage Clearance	1	2	3	4
	0.0030	0.0020	0.0030	0.0025

End of Test Compression Pressure (psig)	168	160	165	163	163	163

End of Test Blow-By Rate	RPM	Oil Pressure, psi	Flow Rate, cfm	Pressure, in.
	600	26	0.308	0.2
	1800	41	0.315	0.3

Manufacturer's Production Specifications

Compression Ring Gaps	
Top/Bottom	0.010 - 0.020
Cylinder Bore Diameter	3.5050 ± 0.0015
Out of Round	0.0008
Taper	0.0008
Camshaft Lobe Height	
Intake	0.231
Exhaust	0.263
Valve Stem to Guide Clearance	
Intake/Exhaust	0.0010 - 0.0027
Connecting Rod Bearings Clearance	0.0014 - 0.0037
Crankshaft Main Bearings Clearance	0.0016 - 0.0032

a = All measurements are in inches
* = L = Longitudinal; T = Transversal
I = Intake; E = Exhaust

U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION TEST PROGRAM

		Fuel	Miles
Engine Type:	1.6 Liter		
Vehicle No.:	CN0438		
Vehicle Type:	Ford Escort	M-85	23,690
Location:	Fort Ord, California	Total	23,690

Engine Wear Measurements[a]

Cylinder Number

	1		2		3		4	
Compression Ring Gaps								
Top	0.048		0.033		0.032		0.037	
Bottom	0.038		0.042		0.039		0.040	
Cylinder Bore Diameter	L*	T	L	T	L	T	L	T
Top	3.1512	3.1506	3.1519	3.1509	3.1512	3.1506	3.1512	3.1506
Middle	3.1523	3.1508	3.1526	3.1510	3.1522	3.1508	3.1519	3.1511
Bottom	3.1526	3.1506	3.1523	3.1513	3.1519	3.1510	3.1520	3.1510
Out of Round	0.0006		0.0010		0.0006		0.0006	
Taper	0.0014		0.0004		0.0007		0.0008	
	I	E	I	E	I	E	I	E
Camshaft Lobe Height	0.226	0.228	0.228	0.227	0.219	0.226	0.226	0.223
Valve Stem to Guide Clearance	0.0040	0.0060	0.0040	0.0060	0.0030	0.0070	0.0040	0.0070
Connecting Rod Bearings Plastigage Clearance	0.0015		0.0015		0.0015		0.0015	
End of Test Compression Pressure (psig)	200		200		200		200	

Crankshaft Main bearings	1	2	3	4	5
Plastigage Clearance	0.0015	0.0013	0.0015	0.0013	0.0017

End of Test Blow-By Rate	RPM	Oil Pressure, psi	Flow Rate, cfm	Pressure, in.
	800	15	0.260	<0.1
	1800	31	0.500	<0.1

Manufacturer's Production Specifications

Compression Ring Gaps	
Top	0.012 - 0.020
Bottom	0.012 - 0.020
Cylinder Bore Diameter	
Out of Round	0.001
Taper	0.010
Camshaft Lobe Height	
Intake/Exhaust	0.224-0.229
Valve Stem to Guide Clearance	
Intake	0.0008 - 0.0027
Exhaust	0.0018 - 0.0037
Connecting Rod Bearings Clearance	0.0008 - 0.0015
Crankshaft Main Bearings Clearance	0.0008 - 0.0015

a = All measurements are in inches
* = L = Longitudinal; T = Transversal
I = Intake; E = Exhaust

U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION TEST PROGRAM

		Fuel	Miles
Engine Type:	1.6 Liter		
Vehicle No.:	CN0440		
Vehicle Type:	Ford Escort	M-85	23,847
Location:	Fort Ord, California	Total	23,847

Engine Wear Measurements[a]

Cylinder Number

	1		2		3		4	
Compression Ring Gaps								
Top	0.035		0.031		0.033		0.032	
Bottom	0.037		0.037		0.037		0.038	
Cylinder Bore Diameter	L*	T	L	T	L	T	L	T
Top	3.1521	3.1508	3.1514	3.1509	3.1518	3.1510	3.1518	3.1512
Middle	3.1531	3.1508	3.1524	3.1509	3.1529	3.1511	3.1531	3.1514
Bottom	3.1531	3.1507	3.1521	3.1510	3.1525	3.1513	3.1528	3.1515
Out of Round	0.0013		0.0005		0.0008		0.0006	
Taper	0.0010		0.0007		0.0007		0.0010	
	I	E	I	E	I	E	I	E
Camshaft Lobe Height	0.227	0.226	0.227	0.216	0.227	0.215	0.227	0.211
Valve Stem to Guide Clearance	0.0025	0.0050	0.0030	0.0050	0.0025	0.0040	0.0040	0.0040
Connecting Rod Bearings Plastigage Clearance	0.0015		0.0015		0.0015		0.0015	
End of Test Compression Pressure (psig)	210		205		200		210	

Crankshaft Main Bearings Plastigage Clearance	1	2	3	4	5
	0.0015	0.0010	0.0015	0.0010	0.0015

End of Test Blow-By Rate	RPM	Oil Pressure, psi	Flow Rate, cfm	Pressure, in.
	800	15	0.320	<0.1
	1800	31	0.375	<0.1

Manufacturer's Production Specifications

Compression Ring Gaps	
Top	0.012 - 0.020
Bottom	0.012 - 0.020
Cylinder Bore Diameter	
Out of Round	0.001
Taper	0.010
Camshaft Lobe Height	
Intake/Exhaust	0.224-0.229
Valve Stem to Guide Clearance	
Intake	0.0008 - 0.0027
Exhaust	0.0018 - 0.0037
Connecting Rod Bearings Clearance	0.0008 - 0.0015
Crankshaft Main Bearings Clearance	0.0008 - 0.0015

a = All measurements are in inches
* = L = Longitudinal; T = Transversal
I = Intake; E = Exhaust

U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION TEST PROGRAM

		Fuel	Miles
Engine Type:	1.6 Liter		
Vehicle No.:	CN0545		
Vehicle Type:	Ford Escort	M-85	24,873
Location:	Sierra Army Depot	Total	24,873

Engine Wear Measurements[a]

	Cylinder Number							
	1		2		3		4	
Compression Ring Gaps								
Top	0.032		0.030		0.030		0.032	
Bottom	0.037		0.035		Broken		0.035	
Cylinder Bore Diameter	L*	T	L	T	L	T	L	T
Top	3.1524	3.1512	3.1515	3.1510	3.1522	3.1512	3.1522	3.1511
Middle	3.1532	3.1513	3.1522	3.1508	3.1530	3.1512	3.1527	3.1513
Bottom	3.1531	3.1512	3.1520	3.1509	3.1525	3.1514	3.1525	3.1513
Out of Round	0.0012		0.0005		0.0010		0.0011	
Taper	0.0007		0.0005		0.0003		0.0003	
Camshaft Lobe Height	I	E	I	E	I	E	I	E
	0.227	0.228	0.227	0.227	0.227	0.227	0.228	0.227
Valve Stem to Guide Clearance	0.0050	0.0060	0.0040	0.0070	0.0040	0.0060	0.0040	0.0060
Connecting Rod Bearings Plastigage Clearance	0.0015		0.0015		0.0015		0.0015	
End of Test Compression Pressure (psig)	200		210		210		160	
Crankshaft Main Bearings Plastigage Clearance	1	2	3	4	5			
	0.0013	0.0015	0.0013	0.0015	0.0015			

End of Test Blow-By Rate	RPM	Oil Pressure, psi	Flow Rate, c/m	Pressure, in.
	800	22	0.390	60.1
	1800	47	0.420	60.1

Manufacturer's Production Specifications

Compression Ring Gaps	
Top	0.012 - 0.020
Bottom	0.012 - 0.020
Cylinder Bore Diameter	
Out of Round	0.001
Taper	0.010
Camshaft Lobe Height	
Intake/Exhaust	0.224-0.229
Valve Stem to Guide Clearance	
Intake	0.0008 - 0.0027
Exhaust	0.0018 - 0.0037
Connecting Rod Bearings	
Clearance	0.0008 - 0.0015
Crankshaft Main Bearings	
Clearance	0.0008 - 0.0015

a = All measurements are in inches
* = L = Longitudinal; T = Transversal
I = Intake; E = Exhaust

U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION TEST PROGRAM

		Fuel	Miles
Engine Type:	1.6 Liter		
Vehicle No.	CN0547		
Vehicle Type:	Ford Escort	M-85	26,609
Location:	Sierra Army Depot	Total	26,609

Engine Wear Measurements[a]

	Cylinder Number 1		2		3		4	
Compression Ring Gaps								
Top	0.036		0.035		0.032		0.033	
Bottom	0.037		Broken		0.037		0.036	
Cylinder Bore Diameter	L*	T	L	T	L	T	L	T
Top	3.1512	3.1507	3.1517	3.1512	3.1515	3.1512	3.1511	3.1505
Middle	3.1525	3.1507	3.1526	3.1511	3.1529	3.1512	3.1521	3.1510
Bottom	3.1528	3.1504	3.1524	3.1513	3.1526	3.1514	3.1519	3.1510
Out of Round	0.0005		0.0005		0.0003		0.0005	
Taper	0.0016		0.0007		0.0011		0.0008	
	I	E	I	E	I	E	I	E
Camshaft Lobe Height	0.227	0.227	0.227	0.228	0.229	0.226	0.227	0.229
Valve Stem to Guide Clearance	0.0040	0.0050	0.0030	0.0040	0.0040	0.0040	0.0030	0.0050
Connecting Rod Bearings Plastigage Clearing	0.0010		0.0010		0.0010		0.0010	
End of Test Compression Pressure (psig)	210		195		210		170	

Crankshaft Main Bearings Plastigage Clearance	1	2	3	4	5
	0.0015	0.0015	0.0015	0.0015	0.0015

End of Test Blow-By Rate	RPM	Oil Pressure, psi	Flow Rate, cfm	Pressure, in.
	600	20	0.515	<0.1
	1800	35	0.350	<0.1

Manufacturer's Production Specifications

Compression Ring Gaps	
Top	0.0012 - 0.020
Bottom	0.0012 - 0.020
Cylinder Bore Diameter	
Out of Round	0.001
Taper	0.010
Camshaft Lobe Height	
Intake/Exhaust	0.224-0.229
Valve Stem to Guide Clearance	
Intake	0.0008 - 0.0027
Exhaust	0.0018 - 0.0037
Connecting Rod Bearings Clearance	0.0008 - 0.0015
Crankshaft Main Bearings Clearance	0.0008 - 0.0015

a = All measurements are in inches
* = L = Longitudinal; T = Transversal
I - Intake; E = Exhaust

APPENDIX G

CRC DEPOSIT RATINGS FOR INSPECTED VEHICLES

U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION TEST PROGRAM

CRC Ratings for Test Engines

Type Engine: GM	2.5L, L-4	2.5L, L-4	2.5L, L-4	2.5L, L-4	2.5L, L-4
Type Vehicle: Chevrolet	S-10 PU	S-10 PU	S-10 PU	Citation	Citation
Vehicle Number:	CM 2890	CM 2883	CM 2879	CM 3613	CM 3615
Unleaded Fuel Miles	18,725	6,090	4,908	17,762	16,185
M-85 Fuel Miles	0	8,662	12,295	45,151	22,120
Total Miles	18,725	14,752	17,203	62,913	41,305
Sludge Merit Ratings*					
Rocker Arm Cover	9.75	9.75	9.75	9.60	NR
Front Seal Housing	9.75	9.60	9.40	9.60	NR
Oil Pan	9.75	9.60	9.10	9.75	NR
Valve Deck	9.75	9.75	9.68	9.61	NR
Underside of Block	9.75	9.75	9.75	9.75	NR
Average	9.75	9.69	9.54	9.66	
Varnish Ratings*					
Piston Skirts	9.80	9.90	9.80	9.75	9.82
Ring Sticking	Free	Free	Free	Free	Free
Rocker Arm Cover	**	**	**	**	**
Cam Cover Baffle	**	**	**	**	**
Cylinder Walls	8.66	9.85	9.78	9.80	9.90***
Oil Pan	**	**	**	**	**
Average	9.23	9.88	9.79	9.78	9.87
Other Ratings*					
Oil Rings, % Clogging	< 1	< 1	< 1	< 1	NR
Oil Screen, % Clogging	< 1	< 1	< 1	< 1	NR
Intake Valve Deposits*	8.38*	8.38	7.33	8.22	7.00
Intake Ports, % Plugged	< 5	< 5 **	< 5	31.25	NR
Exhaust Ports, % Plugged	10	NR	NR	NR	NR

* = 10 = Most clean
** = Component could not be rated due to painted surface
*** = Heavy rust in No. 3, light and heavy rust on No. 4
* = Valves and seats pitted; light exhaust leakage
** = Foreign object in No. 4 cylinder (wire or cotter pin)
NR = Not rated

U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION TEST PROGRAM

CRC Ratings for Test Engines

Type Engine: GM	2.8L, V-6	2.8L, V-6	2.8L, V-6	2.8L, V-6	2.8L, V-6	2.8L, V-6
Type Vehicle: Chevrolet	S-10 PU	S-10 PU	S-10 PU	S-10 PU	Citation	Citation
Vehicle No.:	CM 2895	CM 2889	CM 2885	CM 2884	CM 3616	CM 3614
Unleaded Fuel Miles	6,465	6,526	18,147	15, 595	28,257	65,640
M-85 Fuel Miles	17,795	10,905	0	0	30,613	0
Total Miles	24,261	17,431	18,147	15,595	58,870	65,640
Sludge Merit Ratings*						
Left Rocker Arm Cover	9.40	8.20	9.62	9.42	9.10	9.72
Right Rocker Arm Cover	9.60	8.71	9.64	9.46	8.99	9.75
Underside of Intake Manifold	9.68	9.60	9.75	9.72	9.40	9.66
Oil Pan	7.60	8.68	9.60	9.72	2.15	9.60
Left Valve Deck	9.60	9.10	9.75	9.75	9.50	9.75
Right Valve Deck	9.40	9.50	9.75	9.75	9.50	9.75
Pushrod Chamber	9.50	6.10	9.75	9.75	9.50	9.75
Timing Gear Cover	9.50	9.60	9.64	9.68	9.41	9.75
Average	9.29	8.69	9.69	9.66	8.44	9.72
Varnish Ratings*						
Piston Skirts	9.50	9.44	6.38	9.19	9.52	9.57
Rocker Arm Covers	6.03	7.85	8.76	7.27	6.90	6.95
Valve Lifter Bodies	9.53	9.67	7.36	8.92	9.19	8.97
Cylinder Walls	9.42	9.12	7.35	7.94	NR	9.33
Oil Pan	6.40	6.52	7.25	8.45	8.65	7.15
Average	8.18	8.41	7.21	8.16	8.57	8.39
Other Ratings						
Oil Screen % Clogging	< 1	< 1	< 1	< 1	< 1	< 1
Intake Valve Deposits*	7.65	7.48	8.25	7.75	8.18	6.80
Intake Valve Ports, % Clogging	< 5	< 5	< 5	< 1	< 1	12.5

* = 10 = Most clean
NR = Not rated

U. S. ARMY'S METHANOL-FUELED ADMINISTRATIVE VEHICLE DEMONSTRATION TEST PROGRAM

CRC Ratings for Test Engines

Type Engine	1.6 Liter	1.6 Liter	1.6 Liter	1.6 Liter
Type Vehicle	Ford Escort	Ford Escort	Ford Escort	Ford Escort
Vehicle Number	CN0545	CN0547	CN0438	CN0440
M85 Fuel Miles	24,873	26,609	23,690	23,847
Total Miles	24,873	26,609	23,690	23,847
Sludge Merit Ratings*				
Rocker Arm Cover	5.78	9.60	9.52	9.70
Front Seal Housing	9.73	9.80	9.62	9.65
Oil Pan	9.70	9.70	9.64	9.63
Valve Deck	9.70	9.75	9.60	9.27
Underside of Block	9.75	9.75	9.75	9.75
Average	8.93	9.72	9.63	9.60
Varnish Ratings*				
Piston Skirts	9.50	9.73	9.50	9.90
Ring Sticking	Free	Free	Free	Free
Rocker Arm Cover	4.30	5.85	5.40	4.65
Cam Cover Baffle	NR	NR	NR	NR
Cylinder Walls	9.50	9.95	9.50	9.95
Oil Pan	6.80	7.95	6.85	7.38
Average	7.53	8.37	7.81	7.97
Other Ratings*				
Oil Rings, % Clogging	< 1	< 1	< 1	0
Oil Screen, % Clogging	< 1	< 1	< 1	< 1
Intake Valve Deposits*	8.50	9.00	8.50	8.85

* = 10 = Most clean
NR = Not Rated

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FIELD	GROUP	SUB-GROUP	Fleet Test	M85 Engine Conversion
			Methanol Fuel	M85 Engine Oils
			M85 Engine	M85 Refueling Stations

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

A methanol-fueled fleet test demonstration program was conducted using administrative-type vehicles to determine the feasibility of using methanol as an alternative fuel. Over 1,026,000 miles were accumulated using 64 administrative-type vehicles. Approximately 750,000 of these miles were accumulated using M85 methanol fuel. Existing engines engineered for use with gasoline and special methanol engines engineered for use with M85 methanol fuel were included in the demonstration program.

Fuel economy, in miles per gallon, obtained for vehicles using M85 fuel is shown to be approximately one-half that obtained using regular unleaded gasoline. When the costs of M85 fuel and unleaded gasoline are included in economic calculations, it is shown that using M85 increases the fuel cost by a factor of approximately 3.0.

No catastrophic engine failure occurred using either fuel. Even though wear rates, indicated from used oil sample analyses, obtained when using M85 fuel appear to be 2 to 4 times those obtained using unleaded gasoline, actual

(Continued)

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16. SUPPLEMENTARY NOTATION

Color photographs showing wear in the engines of the vehicles are on file at Belvoir RDE Center, STRBE-VF. To conserve project funds, a limited number of reports that include Appendices C and E have been printed. Offices receiving all appendices are noted in the attached distribution list. Complete copies may be obtained from the Defense Technical Information Center.

19. ABSTRACT

wear, from inspections and measurements, does not appear to be as severe. No significant increase in individual vehicle maintenance, other than increased oil drains, was noted for the methanol vehicles.

M85 refueling stations were set up at four fleet test sites, and no significant operational problem, safety or otherwire, was encountered during the program.

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